ÉCOLE DOCTORALE SCIENCES ÉCONOMIQUES, JURIDIQUES, POLITIQUES ET DE GESTION
Université Clermont Auvergne

Ecole Doctorale des Sciences Economiques, Juridiques, Politiques et de gestion
Centre d'Etudes et de Recherche sur le Développement International (CERDI)

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BEYOND THE RESOURCE CURSE: MACROECONOMIC STRATEGIES IN RESOURCE DEPENDENT ECONOMIES

Thèse nouveau régime présentée et soutenue publiquement le 6 décembre 2019

pour l'obtention du titre de Docteur en Sciences Economiques

par

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Remerciements

Je souhaiterais remercier mes directeurs de thèse Mary-Françoise RENARD et Jean-Marin SERRE pour avoir encadré mon travail, tout en ayant préservé mon indépendance et ma liberté de chercheur, et en ayant eu un regard critique et bienveillant sur mon parcours.

Un doctorant n'est rien sans ses congénères et ce doctorat fut l'occasion de rencontres et échanges nombreux.

En premier lieu je souhaiterais remercier Pierre MANDON pour son soutien et ses encouragements constants dans les premiers mois.

Je remercie la FERDI pour m'avoir permis de vivre une expérience unique au Fonds Monétaire International ainsi que Bernardin AKITOBY qui m'a encadré durant ce séjour de recherche.

La thèse est un long parcours ce qui amène le risque d'oublier certains noms au moment de remercier les personnes envers qui nous nous sentons redevables.

Un grand merci à tous les participants et surtout aux organisateurs des Searchballs, savant mélange de chercheurs et apprentis chercheurs qui fut l'occasion de sympathiques moments de détente et de convivialité entre renards des surfaces et chasseurs de girafes.

Il me semble essentiel de remercier toutes les personnes avec qui j'ai partagé mon bureau durant ce doctorat. Entre débats passionnés, éclats de rire, et soutien les uns envers les autres je n'oublierais pas ces moments passés avec vous Martha TESFAYE-WOLDEMICHAEL, Cyril CHALENDARD, Sébastien DESBUREAUX, Hugues CHAMPEAUX, Jérémy PEPY, Pierre LESUISSE, et Elsa GAUTRAIN. En l'écrivant la liste me semble presque courte si bien que dans le doute je remercie toute personne qui ne serait pas susmentionnée et aurait mérité d'y figurer.

Un merci tout particulier va droit à Jules GAZEAUD et Claire GAUBERT qui ont été d'un grand soutien et avec qui j'ai partagé rires joies et difficultés au cours de ces dernières années.

Merci à mes colocataires Clermontois et à l'amicale auvergnate pour m'avoir fait passer de très belles années à vos côtés.

Je voudrais remercier ma famille qui m'a toujours soutenu pendant toutes mes années d'études et s'est toujours assurée que j'avais toutes les chances de mon côté.

Il est temps de conclure ce qui n'est jamais évident lorsqu'on est doctorant et il est évident de finir en remerciant ma compagne Marion COUSTILLET pour avoir eu la patience de me soutenir et de m'aimer pendant ces longs mois loin d'elle. Je suis si heureux de te retrouver enfin.

Résumé

En réponse à la littérature dense concernant les impacts directs et indirects des ressources naturelles sur le développement, cette thèse cherche à analyser les économies dépendantes en ressources naturelles au-delà de la malédiction des ressources naturelles, et analyse 3 problématiques macroéconomiques importantes auxquelles ces pays font face. A l'inverse de la tendance à se focaliser uniquement sur un échantillon de pays selon les ressources produites ou le niveau de développement, cette thèse ne discrimine pas selon ces facteurs afin d'inclure les pays partageant leur exposition à la volatilité des prix des matières premières comme menace importante, tout en analysant les pays ayant eu des fortunes diverses dans la gestion des richesses issues des ressources naturelles.

Tout d'abord, elle fournit une analyse empirique des déterminants de la procyclicité de la politique budgétaire qui est une tendance des autorités budgétaires à fournir des réponses budgétaires dans la même direction que le cycle économique, soit restrictive en période de diminution de la croissance économique, et expansionniste en période de croissance soutenue. Basée sur 81 pays pour la période 1992-2012, l'étude évalue un large ensemble de déterminants potentiels et trouve une importance des facteurs de politique économique pour expliquer la limitation de la procyclicité budgétaire dans la partie croissante du cycle économique. Elle appuie également l'idée que les Fonds Souverains sont plus efficaces que les règles budgétaires pour limiter la procyclicité budgétaire, en particulier à travers la limitation de la hausse des dépenses dans les bonnes périodes économiques.

Le chapitre suivant fournit une étude empirique sur la relation entre les prix des matières premières et la diversification des exportations, une problématique particulièrement importante afin d'évaluer si les pays dépendants en ressources naturelles ont utilisé les hausses de prix comme opportunité pour diversifier leur économie au-delà du secteur des ressources naturelles. A l'aide d'un panel de 78 pays pour la période 1970-2012, il en ressort une relation empirique positive entre les variations des prix des ressources naturelles et la concentration des exportations, en particulier à travers la concentration de l'ensemble des biens exportés auparavant (marge intensive) durant les périodes de hausse des prix des matières premières. Il met également en évidence une plus forte concentration des exportations à la suite de la hausse du prix des ressources naturelles dans les années 2000 que lors de l'épisode des années 1970, ce qui a pu compliquer la reprise économique dans ces pays depuis le retour des prix des matières premières à un niveau bas.

Finalement, cette thèse inclut une analyse critique du concept de Fonds Souverains qui a été une recommandation en vogue pour les pays afin de gérer l'argent issue de leurs ressources naturelles. Après avoir fourni un résumé critique de ce que la notion recouvre, ce dernier chapitre fournit un cadre pour comprendre ces fonds dans un continuum de fonds publiques. Cela permet de déterminer des recommandations quant aux problématiques macroéconomiques pour lesquels ces fonds peuvent être utiles dans le contexte des pays dépendants en ressources naturelles, ainsi que les facteurs qui peuvent diminuer la pertinence ou l'efficacité de tels fonds.

Cette thèse met en lumière la pertinence d'étudier les problématiques importantes auxquelles font faces les pays dépendants en ressources au lieu de rester dans le cadre du long débat de la malédiction des ressources naturelles, et incite à de futurs travaux visant à aider les décideurs politiques de ces pays pour mettre en œuvre des stratégies macroéconomiques adaptées à leurs économies.

Summary

As a response to the intensive literature regarding the direct or indirect impacts of natural resources on economic development, this thesis intends to analyze resource dependent economies beyond the scope of the resource curse and provide analyses on 3 key macroeconomic challenges faced by those countries. Unlike the trend to focus only on a set of countries depending on their resources produced or their level of economic development, this thesis does not discriminate according to these factors to include countries sharing their exposure to international commodity price volatility as a major threat, while analyzing countries which may have had various successes in their management of resource wealth.

First, it empirically analyzes the determinants of fiscal procyclicality which is the tendency of fiscal authorities to give fiscal policy responses in the same direction as the economic cycle, restrictive in case of a decrease of economic growth and expansionary in the periods of sustained economic growth. Based on a sample of 81 countries over 1992-2012, this study assesses a variety of potential candidates and find an importance of political-economy determinants in limiting fiscal procyclicality especially in the higher part of the business cycle. It also provides some support to the idea that Sovereign Wealth Funds are more effective than Fiscal Rules to limit fiscal procyclicality especially through a limitation of expenditure growth in good economic periods.

The next chapter provides an empirical study to the relationship between commodity prices and export diversification, a challenge especially important to assess whether resource dependent economies used commodity price booms as opportunities to diversify their economy away from the resource sector. Based on a panel of 78 countries over 1970-2012 it finds a strong empirical support to the impact of commodity price booms on export concentration especially through a concentration of the mix of already exported products (intensive margin) during periods of commodity price booms and an increase of export diversification during periods of commodity price busts. It also highlights the higher concentration of exports during the 2000s commodity price boom than following the 1970s boom, which may have complicated the recovery of those countries since the reversal of commodity prices to a low level.

Finally, it provides a critical analysis to the concept of Sovereign Wealth Funds which has been a trendy recommendation for countries to manage their resource wealth. After providing a critical review to what this notion may cover, it provides a framework to understand funds labeled as Sovereign Wealth Funds in a continuum of public funds. This enables to give some recommendations regarding the macroeconomic challenges those funds may help managing in the context of resource dependent economies as well as the factors which could limit a fund's relevance or effectiveness.

This thesis highlights the relevance of studying key challenges faced by resource dependent countries instead of focusing to the long-lasting debate of the resource curse and calls for future works to help policymakers in those countries to implement sound macroeconomic strategies for their economies.

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List of Acronyms

AR: Autocorrelation

ARIMA: Autoregressive Integrated Moving Average

BBR: Budget Balance Rule

BoP: Balance of Payments

CCE: Common Correlated Effects

CCEMG: Common Correlated Effects Mean Group

CERDI: Centre d'Etudes et de Recherches sur le Développement International

CEREPS: Cuenta Especial de Reactivación Productiva y Social

CIPS: Cross-sectionally augmented Im-Pesaran-Shin test

CPI: Consumer Price Index

CSCPI: Country-Specific Commodity Price Index

DOTS: Direction of Trade Statistics

DR: Debt Rule

ECF: Extended Credit Facility

EFF: Extended Fund Facility

EITI: Extractive Industries Transparency Initiative

ER: Expenditure Rule

ESF: Exogenous Shock Facility

FAD: Fiscal Affairs Department

FDI: Foreign Direct Investment

FEIREP: Fondo de Estabilización, Inversión Social y Productiva, y Reducción del Endeudamiento Publico

FERDI: Fondation Pour les Etudes et Recherches sur le Développement International

FR: Fiscal Rule

G&S: Goods and Services

GARCH: Generalized Autoregressive Conditional Heteroskedasticity

GDP: Gross Domestic Product

GFCF: Gross Fixed Capital Formation

GIC: Government of Singapore Investment Corporation

GMM: Generalized Method of Moments

HIC: High Income Country

IFS: International Financial Statistics

IMF: International Monetary Fund

ISIC: International Standard Industrial Classification

JSC: Joint Stock Company

LIC: Low Income Country

LMIC: Low-Middle Income Country

LR: Long Run

M: Imports

MG: Mean-Group

N: Number

NBER: National Bureau of Economic Research

ODA: Official Development Assistance

OLS: Ordinary Least Squares

OPEC: Organization of the Petroleum Exporting Countries

PIH: Permanent Income Hypothesis

PJSC: Public Joint Stock Company

PLL: Precautionary and Liquidity Line

PMG: Pooled Mean-Group

PPP: Purchasing Power Parity

PWT: Penn World Table

REER: Real Effective Exchange Rate

RER: Real Exchange Rate

SAFC: Structural Adjustment Facility

SBA: Stand-By Arrangement

SCF: Stand-by Credit Facility

SITC: Standard International Trade Classification

SR: Short Run

SWF: Sovereign Wealth Fund

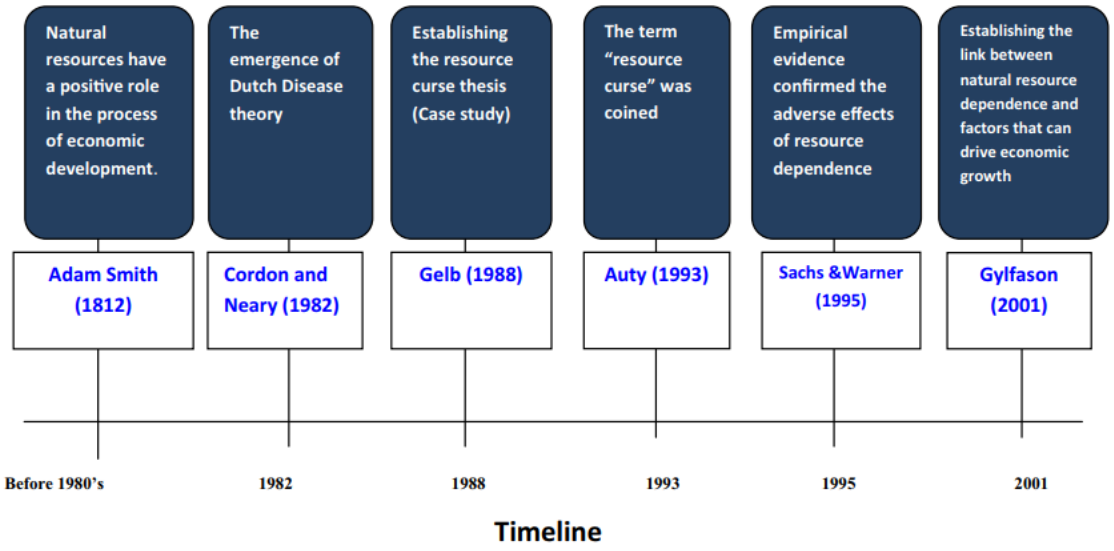
ToT:	Terms of Trade
UMIC:	Upper-Middle Income Country
UN:	United Nations
UNCTAD:	United Nations Conference on Trade and Development
UNSTAT:	United Nations Statistics Division
US:	United States
VA:	Value Added
WDI:	World Development Indicators
WEO:	World Economic Outlook
X:	Exports

1. General Introduction

1.1. Natural resources: Potential curse and channels

1.1.1. Is there a natural resource curse?

There has been a long-lasting debate in the literature to investigate whether natural resources are a blessing or a curse for economic development[1]. Badeeb et al (2017) survey the whole resource curse literature and provide a historical timeline of the views on the subject presented in Figure 1.1.



Source: Badeeb et al (2017)

Figure 1.1: Evolution of the resource curse literature

First envisioned by Adam Smith as positive factors of economic development, natural resources have progressively been identified as detrimental to the economy. Cordon and Neary (1982) identify the Dutch Disease reviewing the case study of the collapse of the manufacturing sector in the Netherlands following natural gas exploitation in the 1970s. As such the Dutch Disease could be viewed as a pioneer of the resource curse view even though we will discuss this point later.

Following Gelb (1988) study on the negative economic effects of oil rents, Auty (1994[2]) first introduced the term resource curse in this literature to illustrate the detrimental effect of resources

[1] Frankel (2010) and Van der Ploeg (2011) provide a comprehensive review of the literature.
[2] 1993 is often regarded as the date when Auty introduced the term "resource curse" because it has been popularized from a draft in 1993 which was published in World Development in January 1994.

on economic development. However, Sachs and Warner (1995) provide the first cross-sectional empirical evidence of a negative relationship between resource dependence and economic growth.

Since the work of Gylfason (2001) the resource curse literature has started to broaden its scope by identifying channels though which resources could have a positive or negative impact on economic growth. Even though the direct impact of natural resources on economic development still provides a rich set of academic studies nowadays, the economic research has progressively moved to analyzing the channels affecting the resource curse[3].

1.1.2. Channels affecting the resource curse

As discussed previously, a first explanation of the resource curse arises through the Dutch Disease phenomenon described in Cordon and Neary (1982). A resource windfalls provides inflationary pressures in the economy through increased public spending triggering domestic inflation which translates to an increase in the price ratio of non-tradable goods over tradable goods, thus feeding real exchange rate appreciation, a loss of price competitiveness and ultimately a decrease of the domestic tradable sector.

A second explanation includes political factors surrounding the competition for resource rents from civil wars (Collier and Hoeffler, 2004), political fractionalization (Bjorvatn et al, 2012), or the deterioration in the quality of governance (Kuralbayeva and Stefanski, 2013). These arguments seem especially important for point resources such as oil or minerals.

An alternative channel may arise from quality of institutions (Boschini et al, 2013), and setting good institutions may mitigate part of the resource curse especially in mining dependent economies by securing property rights.

Carmignani and Avom (2010) analyze the impact of resource intensity on non-monetary outcomes of social development through education and health outcomes and find that resource dependence harness social development through income inequalities and macroeconomic volatility. The detrimental effect is confirmed by Cockx and Francken (2014) on health expenditures.

International policy measures can also play a role as highlighted by the Extractive Industries Transparency Initiative (EITI) which according to Corrigan (2014) mitigates the detrimental effect of resource abundance on economic growth even though it has little impact on political stability or corruption.

The resource curse may depend on the time horizon considered. Collier and Goderis (2012) provide an empirical evidence that commodity price booms trigger a short-run unconditional positive effect while the long-run effect turns out to be negative for non-agricultural commodities, offsetting the positive short-run impact in case of poor governance.

Alternatively, the resource curse may depend on the characteristics of the resource sector with some studies such as Gamu et al (2015) finding a positive effect of small-scale mining on poverty reduction which becomes negative in case of large-scale mining.

[3] Van der Ploeg and Poelhekke (2017) survey the most recent empirical literature on the resource curse reviewing empirical strategies to account for the endogeneity of resource dependence or abundance using indicators such as resource discoveries (Smith, 2015).

Another explanation has emerged from the works of Prebisch (1950) and Singer (1950) which identify a long-run declining trend in commodity prices relative to the price of manufactured goods resulting in a long-run deterioration in the terms of trades. However, more recent empirical studies provide mixed results (Arezki et al, 2014) or that the Prebisch-Singer hypothesis has weaken over the most recent years (Yamada and Yoon, 2014).

As illustrated by the evolution of the views regarding the Prebisch-Singer hypothesis, academical studies of the resource curse literature seem especially sensitive to the commodity price outlook of their contemporary period with a wide view of a detrimental effect of resources on economic development in the period of low commodity prices in the 1980s and 1990s which only began to be challenged with the increase of commodity prices in the late 2000s.

This thesis has especially been influenced by Van der Ploeg and Poelhekke (2009) which find empirical evidence that there is not a direct negative effect of natural resources on economic growth beyond the indirect negative effect through output volatility from volatile commodity prices. They also state that this relationship not only apply to oil exporters but extent to exporters of other commodities such as food, mining, or raw agricultural materials.

It may be time to escape from the resource curse literature when analyzing resource dependent economies, which triggered the motivation of this thesis to analyze those countries beyond the scope of the resource curse literature and to analyze key challenges facing these countries instead. The next section will discuss the key concepts used in this thesis.

1.2. Definitions

1.2.1. Richness abundance or dependence in natural resources?

First, we may wonder whether we should be considering resource richness, resource abundance, or resource dependence.

Most of the literature focuses on resource richness which is a measure of resource rent. It can either corresponds to the rent received by the government, or to the wealth potentially shared or disputed between various entities. The concept of resource-rich countries may be difficult to accurately define because of the difficulty in tracking the production, the effectiveness of the taxation, and the exact definition of the rent which could vary between economic operators.

In fact, the concept of resource richness could easily be mixed up with the concept of resource abundance. This latter corresponds to the geological stock of natural resources which could be found in a country. When adding non-extractive resources this concept can also account for the climate, hydraulic reserves and other environmental factors which influence the potential in producing food, agricultural products, or tropical commodities.

While the concept of resource-abundance is theoretically well-defined, it is not obvious to define a country as resource-abundant across time. This is especially true considering that known resource reserves in a country are endogenous to resource exploration, which is heavily influenced by international commodity prices and the resource production in the rest of the world.

As such, the concept of abundance is more related to a potential to exploit resources which is unknown or at best inaccurately assessed, while resource-richness corresponds to an assessment of the current importance of resource production and the wealth coming along.

A third possibility in defining the importance of the natural resource sector in an economy is linked to the dependence. The notion of dependence implies that the importance of the natural sector should be related to the size of an economy to catch its real importance for one economy. Beyond a certain threshold this importance could be considered as a dependence because the economic activity will depend on the natural resource sector and national governments will heavily rely on resource revenues. However, the most important factor of dependence for these economies is their exposure to international resource price variations.

This thesis focuses on countries which are resource dependent to assess the effectiveness of some key macroeconomic strategies. The importance of natural resources in the economy is a measure of flow instead of stock like for resource-abundance. Among the potential candidates to measure this aggregate, I have selected the export flows which catch this sensitivity to international prices.

I consider countries as resource dependent when the resource exports dependency ratio defined by the share of exports corresponding to natural resources exceeds a certain threshold over a given period. One drawback of this method is not considering the dynamic of resource production and the evolving patterns of commodity specialization in some countries. However, it has been a standard assumption in the literature, and it has the advantage of assessing the same countries across time and prevent the endogenous selection of countries.

The last decade has faced major commodity price variations with a major increase in commodity prices followed by a sharp decrease. This period may have featured a boom-bust episode in a long-lasting commodity price cycle or super-cycle which could bias any computations of a resource dependency ratio over this period. Besides, this period may not be the most relevant in assessing the resource dependence because periods of rising commodity prices trigger resource exploration or new development of resource production capacities which induce changes in the resource specialization patterns.

As such, it seems wise to use the resource dependency ratio defined in the period before the major commodity price swings to select our countries. Another element worth considering is the occurrence of the global financial and economic crisis which has hit hard most countries in the world from 2008. The importance of the shock has differed between countries so we should not consider the post-2008 for the definition because we may discriminate between countries whose exports have been differently affected which may bias our denominator.

With those elements in mind, I have considered the mean resource dependency ratio over the period 2003-2007 to assess resource-dependence around the world. The mean over 5 years is needed due to the erratic nature of yearly trade data and the punctual events modifying resource production from one year to the other (climatic events, production quotas).

As said above, we need to identify the proper threshold of resource-dependence but before doing so we need to explicit which natural resources we are considering.

1.2.2. Defining natural resources

"Natural resources" is a generic term which may encompass things beyond raw materials or commodities such as air and non-tradable environmental elements. However, it has been widely used to cover every tradable resource. We could have preferred the term commodity, but a commodity corresponds to the raw status of the natural resource while it is important to include goods with little local value added between the resource production and the exported product to cover the whole specialization pattern. However, we will use the term commodity when talking about the price of the resource because it corresponds to the international price of a standardized raw resource.

In this thesis I consider every natural resource assuming all of them may harness economic growth through the negative impact of commodity price volatility in line with Van der Ploeg and Poelhekke (2009). Even though some commodities such as oil or minerals could trigger additional institutional problems from an increased probability of conflict, insecure property rights, or a higher propensity of rent-seeking activities; there is a lack of theses which analyze resource dependent countries irrespective of the nature of the commodity produced.

In line with the standard classification of commodity trade, I have considered 4 groups of traded commodities which are food products, raw agricultural materials, mining products, and energy related goods which will help covering the heterogeneity in the resources exported. Appendices in section 1.4.1 and 1.4.2 provide more details regarding the commodity groups.

1.2.3. Defining resource dependent economies

Following the discussion in section 1.2.1, I classify countries as dependent on natural resources when their share of commodity exports exceeds 40% of total goods and services exports over 2003-2007[4]. While it would have been better to get accurate data at the beginning of the time sample in order to select our countries, we prefer as a second-best to select countries according to their dependence on natural resources over this period while relying on their commodity export shares[5]. To consider the importance of resource revenues in fiscal policy management, I have added countries whose commodity exports is under 40% but whose average share of resource revenues exceeds 20% of total revenues over 2003-2007[6].

[4] While this threshold may seem ad hoc it stands slightly above the median commodity exports share (30.6%) in order to remove some countries only partly dependent on natural resources. It has also been motivated by the slightly higher average share of commodity exports share over that period because of slightly higher commodity prices.

[5] It is difficult to get relevant estimates for some important product lines such as diamonds and precious stones or non-monetary gold apart from UNCTAD data which are available from 1995. Moreover, the 2003-2007 period has been selected because it maximizes our country coverage, detailed export data being unavailable before for some countries. An alternative would have been to use the importance of the natural resource sector value added in total GDP but the discrepancy between the ISIC (for value added sectors) and SITC (for exports sectors) prevent us from using it. For instance, numerous partly transformed goods classified as agricultural or mining products under the SITC are included in the manufacturing sector (sector C) under the ISIC, giving a misleading pattern or resource dependence.

[6] Resource revenues come from the WEO database.

The resulting sample consists of 81 countries identified in this thesis as resource dependent, which includes 23 Low Income Countries (LICs), 24 Low-Middle Income Countries (LMICs), 21 Upper-Middle Income Countries (UMICs), and 13 High Income Countries (HICs).

In order to gauge the specialization pattern of our countries, we may classify a country dependent on food, raw agricultural, mining, or energy exports when the average share of exports from one of these commodity groups exceeds 20% of total exports of goods and services over 2003-2007[7]. This defines 23 countries as food exports dependent, 6 countries as raw agricultural materials exports dependent, 23 countries as mining exports dependent, and 39 countries as energy exports dependent[8]. Further details regarding the aggregation of commodity exports data is provided in section 1.4.2.

From this sample, 3 countries do not meet the commodity export share criterion but fulfill the resource revenue dependence one (Mexico, Timor-Leste, Swaziland). While it will be useful to add them for the empirical analysis of fiscal procyclicality (chapter 2) they will be removed from the analysis of export diversification (chapter 3).

As we can identify in figure 1.2 below, some countries such as the United States and China does not appear as resource dependent even though they are abundant in natural resources. This highlights that what matters for our study is the relative importance of the resource sector relative to total exports and not the size of the resource sector per se.

[7] We include a country as dependent on energy exports when the average share of hydrocarbon revenues (WEO) over total revenues is beyond 20% over 2003-2007.

[8] The two countries whose energy exports do not reach the 20% threshold but whose hydrocarbon revenues exceed 20% of government revenues over 2003-2007 are Mexico and Timor-Leste.

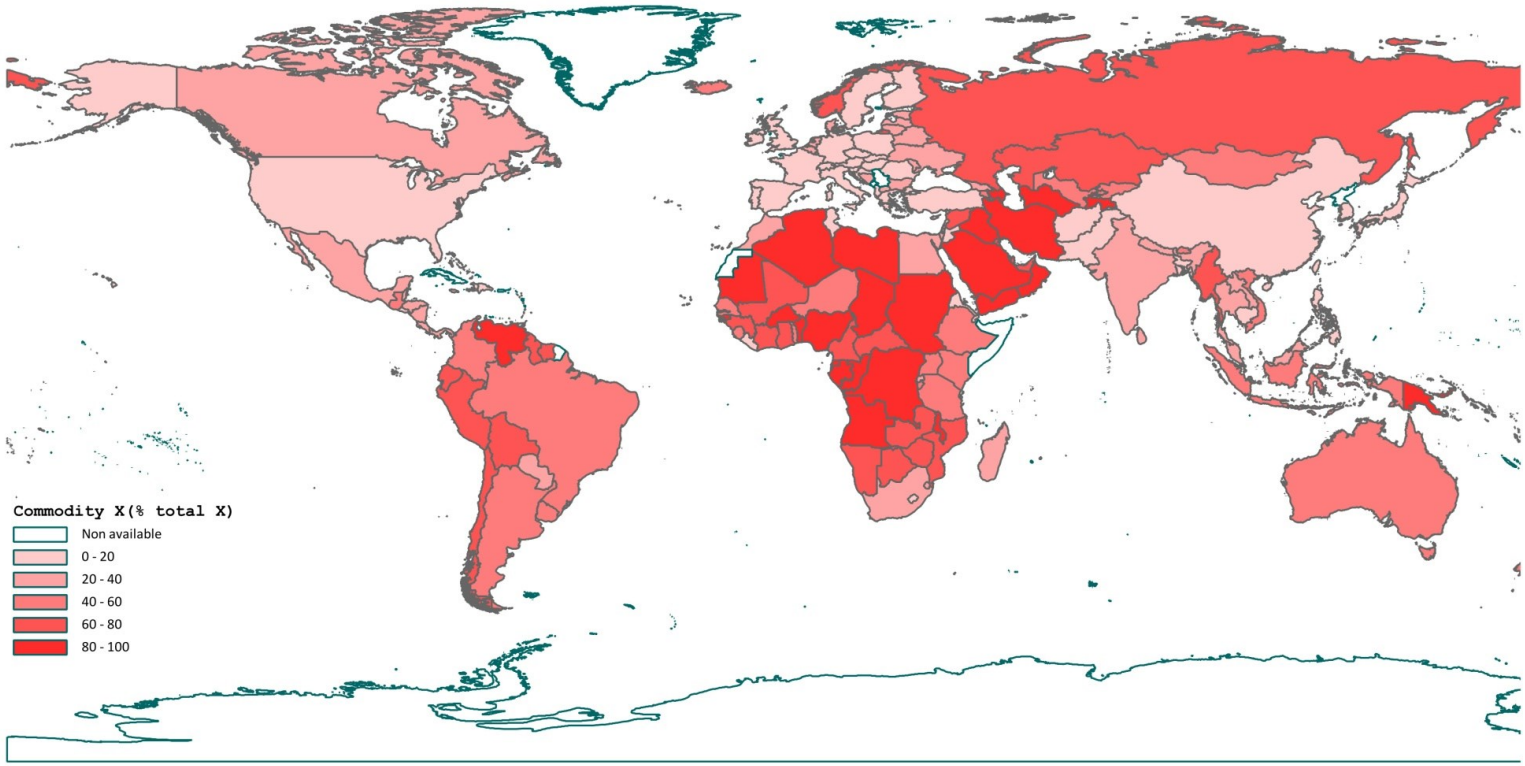


Figure 1.2: Geographical representation of resource-dependence for 2003-2007

1.3. Beyond the resource curse: Macroeconomic strategies in resource dependent economies

As explained previously, this thesis provides a step aside the resource curse literature by assessing 3 key macroeconomic strategies for resource dependent economies irrespective to their resource exported or their level of economic development.

Chapter 2 will analyze the determinants of fiscal procyclicality, which especially matters due to the detrimental effects of procyclical economic policies and the volatility of fiscal revenues coming from volatile commodity prices. It may help shed some light on a wide set of factors from political economic, financial, or macroeconomic factors which may explain fiscal procyclicality, as well as comparing the efficiency of institutional frameworks aimed at tackling it such as Fiscal Rules or Sovereign Wealth Funds.

Then, chapter 3 will focus on the impact of commodity price booms and busts episodes on export diversification. This question is especially important to assess whether countries took commodity price booms as opportunities to diversify their economy away from resource sectors, a challenge especially important in countries relying on the production of exhaustible resources.

Finally, chapter 4 focuses on the concept of Sovereign Wealth Funds to analyze deeply what are the realities of this notion which has been a trendy recommendation for countries in the management of natural resource wealth. After a first exploration of the concept including non-resource related funds, it will feature a discussion on the potential macroeconomic challenges a fund could help tackle, as well as on the limitations which may question policymakers at the time of deciding the launch of a so-called Sovereign Wealth Fund.

1.4. Appendices

1.4.1. Aggregation of commodity exports

We compute natural resources exports merging data from UNCTAD for the period 1995-2012 and from COMTRADE when available before 1995.

One traditional drawback of these data is the problem of 0 values which are difficult to identify between a false or a true 0. While establishing a model to tackle this bias is beyond the scope of this thesis, we benefit from UNCTAD data which complement COMTRADE data with estimates for missing values. As a result, this enables us to increase significantly our country coverage as well as to bypass this bias.

As it is standard in the literature, we define exports by commodity groups defined according to the 3rd revision of the SITC such as:

-Agricultural raw materials=2-22-27-28

-Food products=0+1+4+22

-Energy products=3

-Mining products=27+28+667+68+971

1.4.2. Trade and price matching

Our first source of price data is the IFS who provides monthly commodity price series. When we decided to introduce other categories or to complement missing data, we used data from UNCTAD. Every nominal commodity price index has been deflated by the US consumer price index and then de-seasonalized thanks to the X12-ARIMA procedure of the Census Bureau.

As noticed by Medina (2010), the matching between trade data from the standard SITC and commodity price indices necessitate making some assumptions. First, SITC categories (3rd revision) which are the closest possible from the definition of the commodity price series are matched to get exports data by commodity going up to a 5-digit categories level of accuracy in the SITC classification.

As stated above the importance of missing data in the COMTRADE database, motivated the use of UNCTAD data. However, the UNCTAD database provides estimates for missing data only at the 3-digit categories level. At this point we had to make additional assumptions.

Over the period 2003-2007, a coefficient catching the relative importance of the different commodities at the 4 or 5-digit level in each 3-digit category has been computed when the resources could have been identified with COMTRADE data and when they represent together a significant share of the 3-digit category aggregate. Because of missing data, this coefficient is identical for every country in the database and represents the global mean importance of these product categories which gives us a figure the least biased by missing data as possible.

In the tables below, the figures between brackets correspond to the number of commodities which are represented in the corresponding 3-digit category. For instance, the exports value from category 057 ‘‘Fruit and nuts (not including oil nuts), fresh or dried’’ has been split in constant shares between orange exports and bananas exports depending on the mean relative importance of sub-categories 0571 ‘‘Oranges, mandarins, clementines and similar citrus hybrids, fresh or dried’’ and 0573 ‘‘Bananas (including plantains), fresh or dried’’.

Commodity	Mean weight	UNCTAD 3-digit SITC code (rev 3)	COMTRADE up to 5-digit SITC code (rev 3)	Data source
Bananas	2.57	057(2)	0573	UNCTAD
Barley	0.12	043	043	IMF
Beef	1.48	001(4), 011, 016(2), 017(3)	0011, 011, 01251, 01252, 01681, 0176	IMF
Cocoa	1.90	072, 073	072, 073	UNCTAD
Coconut oil	0.35	422(4)	4223	IMF
Coffee	3.13	071	071	IMF[1]
Copra	0.26	081(10), 223(3)	08137, 2231	IMF
Cottonseed oil	0.09	081(10), 222(4), 421(4)	08133, 2223, 4212	UNCTAD
Fish	3.43	034, 035, 037(2)	034, 035, 0371	IMF[2]
Fish meal	0.20	081(10)	08142	IMF
Groundnuts	0.12	081(10), 222(4)	08132, 2221	IMF
Groundnuts oil	0.26	421(4)	4213	IMF
Lamb	0.08	001(4), 012(3)	0012, 0121, 01255, 01256	IMF
Linseed oil	0.02	223(3), 422(4)	2234, 4221	IMF
Maize	0.28	044, 047, 081(10)	044, 04711, 04721, 05461, 08124	IMF
Olive oil	0.44	421(4)	4214	IMF
Orange	0.80	057(2), 059	0571, 0591	IMF[2]
Palm kernel oil	0.02	422(4)	4224	IMF
Palm oil	0.32	223(3), 422(4)	2232, 4222	IMF
Pepper	0.24	075	0751	UNCTAD
Poultry	0.43	001(4), 012(3), 017(3)	0014, 0123, 0174	IMF
Rice	0.52	042, 081(10)	042, 08125	IMF
Shrimp	1.44	036, 037(2)	036, 0372	IMF
Soybean	0.50	222(4)	2222	IMF
Soybean meal	0.36	081(10), 098	08131, 09841	IMF
Soybean oil	0.14	421(4)	4211	IMF
Swine	0.50	001(4), 012(3), 016(2), 017(3)	0013, 0122, 01253, 01254, 0161, 0175	IMF
Sugar	1.45	061, 062, 081(10)	05487, 05488, 06, 0815	IMF[1]
Sunflower oil	0.24	081(10), 222(4)	08135, 2224	IMF
Tea	0.82	074	074	IMF
Tobacco	1.77	121	121	IMF
Wheat	0.72	041, 046, 048, 081(10)	041, 046, 048, 08126	IMF

Table A.1: Data sources regarding trade and prices of food products

Commodity	Mean weight	UNCTAD 3-digit SITC code (rev 3)	COMTRADE up to 5-digit SITC code (rev 3)	Data source
Cotton	4.65	263	263	UNCTAD[1]
Hides	0.27	211, 212	211, 212	IMF
Rubber	0.36	231	23	IMF[1]
Timber	3.53	245, 246, 247, 248	24	IMF[1]
Wood pulp	0.25	251	251	IMF
Wool	0.39	268	268	IMF

Table A.2: Data sources regarding trade and prices of agricultural raw materials

Commodity	Mean weight	UNCTAD 3-digit SITC code (rev 3)	COMTRADE up to 5-digit SITC code (rev 3)	Data source
Aluminum	5.24	285, 288(6), 684	285, 28823, 684	IMF
Copper	5.40	283, 288(6), 682	283, 28821, 682	IMF
Diamonds	4.36	667	667	IMF, Bloomberg[3]
Gold	4.49	971	971	IMF
Iron ore	1.49	281, 282	281, 282	IMF
Lead	0.18	287(3), 288(6), 685	2874, 28824, 685	IMF
Manganese ore	0.27	287(5)	2877	UNCTAD
Nickel	0.67	284, 288(6), 683	284, 28822, 683	IMF
Phosphate	0.17	272(2)	2723	IMF
Potash	0.09	272(2)	2724	IMF
Silver	0.44	289, 681	28911, 6811	IMF
Tin	0.38	287(5), 288(6), 687	2876, 28826, 687	IMF
Tungsten ore	0.07	287(5)	28792, 68911	UNCTAD
Uranium	0.66	286	2861	IMF
Zinc	0.83	287(5), 288(6), 686	2875, 28825, 686	IMF

Table A.3: Data sources regarding trade and prices of mining products

Commodity	Mean weight	UNCTAD 3-digit SITC code (rev 3)	COMTRADE up to 5-digit SITC code (rev 3)	Data source
Coal	1.02	321, 322, 325	32	IMF[2]
Crude oil	27.80	333	333	IMF[1]
Gasoline	7.31	334, 335	334, 335	IMF[2]
Natural gas	6.18	342, 343, 344	34	IMF[12]

Table A.4: Data sources regarding trade and prices of energy products

Mean weight: Average time-invariant and country-specific weights over the whole sample.
3-digit (UNCTAD): Product codes following the SITC revision 3 classification.
Up to 5 digits (COMTRADE): Product codes following the SITC revision 3 classification.
In parenthesis, the number of commodity groups to which the 3-digit line refers (e.g. the line 037 includes both fish and shrimp). To disentangle the export value for each commodity group I compute the relative share of each commodity over the sample computed thanks to the average weights over the whole sample previously obtained thanks to the 5-digits COMTRADE data (e.g. fish will get 8.04/(8.04 +3.82) times the value of line 037).
1: Simple average of the available prices.
2: Computation of missing values thanks to the rate of growth of the closest commodity price available (crude oil price for coal, uranium, gasoline and natural gas; bananas price for oranges; and fish meal price for fish).
3: Diamond prices are only available on a daily basis over 2002-2012. Since this commodity group is the 6th most important in our basket, we didn't remove it and used the metal price index (weighted average of copper, aluminum, iron ore, tin, nickel, zinc, and lead prices) from the IMF instead of diamonds prices for previous variations.

1.4.3. Commodity specialization patterns of resource dependent countries

Country	% total exports					Main commodities in the CSCPI with corresponding weights computed over 2003-2007
	Raw agri	Food	Mining	Energy	Commodities	
Benin (BEN)	**48.7**	**22.0**	7.9	17.0	94.3	Cotton 49.2, Gasoline 17.4, Bananas 7.7
Chad (TCD)	17.3	0.1	0.1	**73.8**	91.3	Crude oil 75, Cotton 16.5, Gasoline 7.9
Guinea-Bissau (GNB)	1.1	**75.3**	0.5	7.0	84.0	Bananas 66.3, Orange 16.3, Crude oil 11.7
Malawi (MWI)	3.6	**79.8**	0.3	0.2	83.9	Tobacco 66.7, Sugar 12, Tea 8.4
Tajikistan (TJK)	16.9	7.5	**70.5**	7.4	83.4	Aluminum 72.9, Cotton 19
Mauritania (MRT)	0.2	**34.7**	**39.9**	7.6	82.5	Iron ore 43.8, Fish 20.7, Crude oil 10.5, Copper 5.9
Burkina Faso (BFA)	**63.0**	15.9	1.8	0.2	81.0	Cotton 81.8
Dem. Rep. of Congo (COD)	5.7	2.1	**62.3**	10.8	80.9	Diamonds 44.7, Crude oil 13.4, Copper 9.8, Zinc 8.2, Timber 7.9
Guinea (GIN)	2.0	6.8	**58.3**	12.4	79.4	Aluminum 56.6, Crude oil 13.7, Copper 6.9
Mozambique (MOZ)	3.7	17.1	**46.3**	11.7	78.8	Aluminum 61.2, Tobacco 9.1, Shrimp 5.1
Mali (MLI)	**38.1**	4.4	**30.8**	0.4	73.6	Cotton 51.3, Gold 42
Zimbabwe (ZWE)	11.3	**26.9**	**30.3**	5.1	73.5	Nickel 34.1, Tobacco 25.3, Cotton 10.5, Coal 7.9, Gold 5.4
Central Afr. Rep. (CAF)	**35.4**	2.4	**33.9**	0.9	72.6	Timber 42, Diamonds 38.8, Cotton 12.1
Myanmar (MMR)	17.6	17.2	3.7	**28.0**	66.5	Natural gas 46.5, Timber 28.5, Shrimp 6.9
Burundi (BDI)	2.2	**34.7**	**20.4**	0.5	57.7	Coffee 51.5, Gold 30.9, Tea 5.2
Uganda (UGA)	7.6	**40.5**	5.7	0.9	54.6	Coffee 29.2, Fish 23.5, Tobacco 8.9, Gold 8.9, Cotton 6.8, Tea 5.6
Tanzania (TZA)	5.5	**22.6**	19.0	2.1	49.2	Gold 22.7, Fish 12.5, Tobacco 8.3, Silver 7.2, Copper 6.7, Coffee 6.7, Cotton 6
Niger (NER)	2.2	17.0	**20.3**	7.1	46.6	Uranium 42.9, Beef 18.3, Gasoline 14.7, Crude oil 7.6, Gold 5.5
Togo (TGO)	9.5	16.6	9.2	11.0	46.3	Gasoline 24.6, Cotton 19.6, Cocoa 13.3, Phosphate 11.2, Potash 5.9
Sierra Leone (SLE)	0.9	13.9	**29.6**	1.1	45.3	Diamonds 49.1, Coffee 21.5, Cocoa 6.8, Aluminum 6.1
Kenya (KEN)	8.3	**25.6**	2.2	7.1	43.2	Tea 37.7, Gasoline 25.7, Coffee 9.5, Fish 5.8
Kyrgyzstan (KGZ)	5.7	8.9	19.3	9.1	43.0	Gold 38.2, Gasoline 18.1, Cotton 11.3, Iron ore 7.2
Ethiopia (ETH)	8.4	**31.7**	2.9	0.0	43.0	Coffee 53.1, Soybean 10, Gold 9.1

Table A.5: Commodity specialization pattern for resource dependent LICs

Country	% total exports					Main commodities in the CSCPI with corresponding weights computed over 2003-2007
	Raw agri	Food	Mining	Energy	Commodities	
Iraq (IRQ)	0.1	0.6	0.4	**98.0**	98.4	Crude oil 97.7
Papua New Guinea (PNG)	9.3	18.9	**41.4**	**23.7**	93.3	Crude oil 22.8, Copper 20.7, Gold 20.4, Timber 9.6
Nigeria (NGA)	0.3	1.4	0.3	**89.9**	92.0	Crude oil 89.8, Natural gas 5.9
Rep. of Congo (COG)	5.8	0.9	5.9	**79.2**	91.9	Crude oil 81, Timber 6.1
Sudan (SDN)	3.4	6.7	2.7	**74.0**	86.9	Crude oil 55, Gasoline 32.9
Yemen (YEM)	0.3	4.5	1.6	**74.8**	81.3	Crude oil 85, Gasoline 7.7
Bolivia (BOL)	1.8	17.8	17.3	**41.8**	78.7	Natural gas 44.1, Crude oil 9.5, Tin 7.3
Zambia (ZMB)	4.0	9.3	**58.0**	0.9	72.2	Copper 77.9
Solomon Islands (SLB)	**52.3**	18.5	0.3	0.3	71.4	Timber 72.6, Fish 15.2
Guyana (GUY)	5.1	**33.4**	**28.3**	0.0	66.8	Sugar 25.1, Gold 22, Aluminum 11.7, Rice 10.2, Diamonds 8.4, Timber 7.7, Shrimp 6.9
Cote d'Ivoire (CIV)	7.5	**36.8**	0.5	**21.7**	66.4	Cocoa 41.7, Gasoline 21.6, Crude oil 11.7
Ghana (GHA)	5.5	**43.1**	11.3	4.2	64.1	Cocoa 54, Tea 7.3, Gold 5.9
Cameroon (CMR)	12.9	12.3	2.9	**35.1**	63.2	Crude oil 49, Timber 14.5, Cocoa 8.7, Gasoline 7.5, Bananas 5.4
Syria (SYR)	2.2	15.1	1.3	**43.1**	61.6	Crude oil 64.8, Gasoline 14.3
Mongolia (MNG)	5.6	1.5	**49.1**	3.2	59.4	Copper 50.8, Gold 22.3, Wool 8.6
Uzbekistan (UZB)	**22.8**	9.0	13.3	11.9	57.1	Cotton 41.6, Natural gas 19.1, Copper 11.8, Bananas 7, Gold 6.9
Indonesia (IDN)	4.8	10.7	7.6	**23.0**	46.1	Natural gas 20, Crude oil 17.1, Copper 10, Coal 9.5, Rubber 6.7, Coconut oil 6, Palm oil 5.4, Gasoline 5.3
Bhutan (BTN)	0.5	13.3	12.8	19.0	45.6	Copper 47, Bananas 10.4, Coconut oil 9.1, Palm oil 8.1
Armenia (ARM)	1.1	8.6	**32.9**	1.3	43.9	Diamonds 52.8, Copper 21.2, Aluminum 6
Vietnam (VNM)	2.8	18.0	0.7	**20.2**	41.7	Crude oil 45, Shrimp 13, Rice 7.9, Fish 6.7, Coffee 6.4, Rubber 5.1
Guatemala (GTM)	2.9	**31.3**	1.6	4.7	40.5	Coffee 21.7, Bananas 17.1, Sugar 16.1, Crude oil 10.3, Oranges 5
Senegal (SEN)	1.7	**22.2**	3.1	13.5	40.5	Gasoline 34.1, Fish 22.4, Shrimp 16.4, Crude oil 5.7
Swaziland (SWZ)	*7.3*	***23.5***	*1.7*	*1.1*	*33.5*	*Sugar 21.5, Wood pulp 21.9*
Timor-Leste (T-L)	*0.1*	*2.5*	*0.2*	*8.9*	*11.7*	*Crude oil 44.3, Natural gas 34.9, Coffee 15.6*

Table A.6: Commodity specialization pattern for resource dependent LMICs

Country	% total exports					Main commodities in the CSCPI with corresponding weights computed over 2003-2007
	Raw agri	Food	Mining	Energy	Commodities	
Angola (AFG)	0.0	0.1	2.2	**94.1**	96.4	Crude oil 95.7
Algeria (DZA)	0.0	0.2	0.5	**92.9**	93.6	Crude oil 53.8, Natural gas 36.4, Gasoline 9.1
Libya (LBY)	0.0	0.1	0.6	**88.3**	89.0	Crude oil 86.9, Gasoline 9.8
Gabon (GAB)	10.8	0.7	5.3	**69.1**	85.9	Crude oil 79.1, Timber 12.4
Turkmenistan (TKM)	2.5	0.1	0.6	**81.9**	85.1	Natural gas 78.2, Gasoline 14.5
Venezuela (VEN)	0.1	1.0	4.5	**77.2**	82.8	Crude oil 76, Gasoline 16.6
Azerbaijan (AZE)	1.1	4.0	2.7	**75.0**	82.7	Crude oil 73.5, Gasoline 18.4
Iran (IRN)	0.4	2.5	2.2	**75.1**	80.1	Crude oil 89.7
Ecuador (ECU)	3.9	**26.4**	0.6	**47.7**	78.6	Crude oil 59.2, Bananas 12.1, Shrimp 7.1, Gasoline 5.6, Fish 5
Kazakhstan (KAZ)	0.8	3.5	14.2	**59.6**	78.0	Crude oil 69.3, Copper 7.6
Botswana (BWA)	0.1	2.0	**73.2**	0.1	75.5	Diamonds 81.2, Copper 8.3, Nickel 7.2
Peru (PER)	1.4	14.7	**52.1**	6.8	75.0	Copper 27.2, Gold 22.6, Zinc 7.8, Gasoline 7.1, Tin 5.2
Suriname (SUR)	0.5	11.4	**58.5**	3.7	74.0	Aluminum 53.9, Gold 26.6, Gasoline 5
Chile (CHL)	5.8	16.9	**48.7**	2.0	73.3	Copper 62.4, Fish 7, Bananas 6
Russia (RUS)	2.6	1.6	7.2	**52.8**	64.1	Crude oil 44, Natural gas 18.6, Gasoline 18.3
Namibia (NAM)	0.6	**24.4**	**36.5**	1.0	62.5	Diamonds 33.2, Fish 25.4, Zinc 15.2, Uranium 6.8, Copper 5.7, Beef 5.3
Argentina (ARG)	1.2	**40.8**	3.7	13.0	58.7	Gasoline 10.9, Crude oil 9.7, Wheat 8.4, Soybean meal 7.5, Maize 6.3, Soybean 5.2, Natural gas 5.1
Colombia (COL)	4.0	14.2	4.7	**32.3**	55.1	Crude oil 32.3, Coal 20.1, Gasoline 11.9, Coffee 11.8, Gold 5.9
Uruguay (URY)	6.9	**36.8**	1.3	2.5	47.5	Beef 36.7, Rice 11.5, Wool 8.5, Timber 7.1, Fish 6.5, Gasoline 5.8
Brazil (BRA)	3.5	**23.4**	9.4	5.6	41.9	Iron ore 14.1, Crude oil 9.5, Sugar 8.8, Aluminum 6.3, Soybean 6.3, Gasoline 5.9, Coffee 5.6, Beef 5
Mexico (MEX)	*0.4*	*5.0*	*2.1*	*13.0*	*20.6*	*Crude oil 68.9, Gasoline 6.9,*

Table A.7: Commodity specialization pattern for resource dependent UMICs

Country	% total exports					Main commodities in the CSCPI with corresponding weights computed over 2003-2007
	Raw agri	Food	Mining	Energy	Commodities	
Equatorial Guinea (GNQ)	2.1	0.1	0.0	**90.7**	92.9	Crude oil 94.1
Saudi Arabia (SAU)	0.1	0.8	0.6	**81.9**	83.4	Crude oil 85.1, Gasoline 9.6
Oman (OMN)	0.0	2.6	0.9	**79.8**	83.3	Crude oil 78.6, Natural gas 16.9
Brunei (BRN)	0.0	0.1	0.4	**82.4**	83.0	Crude oil 62.9, Natural gas 36.2
Kuwait (KWT)	0.1	0.3	0.7	**78.1**	79.2	Crude oil 68.3, Gasoline 26.2
Qatar (QAT)	0.0	0.1	0.3	**76.8**	77.2	Crude oil 59.4, Natural gas 34.6, Gasoline 5.6
United Arab Emirates (ARE)	0.2	2.9	9.6	**60.2**	72.9	Crude oil 65.6, Gasoline 11.7, Natural gas 6.9
Trinidad and Tobago (TTO)	0.0	2.7	1.0	**59.9**	63.6	Natural gas 46.9, Gasoline 32.1, Crude oil 17.3
Norway (NOR)	0.4	4.1	5.4	**50.1**	60.1	Crude oil 56, Natural gas 22.9, Fish 6, Aluminum 5.5, Gasoline 5.4
Bahrain (BHR)	0.0	1.2	**26.8**	**29.4**	57.4	Gasoline 48.3, Aluminum 36.5, Iron ore 6.5
Australia (AUS)	3.1	12.5	**22.2**	17.2	55.0	Coal 19.9, Iron ore 11.7, Aluminum 11.1, Gold 8.3, Crude oil 6.9, Beef 5.9, Copper 5.4, Natural gas 5.1
Iceland (ISL)	0.5	**35.8**	13.9	0.8	51.0	Fish 60.2, Aluminum 27.4
New Zealand (NZL)	7.6	**34.7**	3.7	1.9	47.8	Beef 18.3, Timber 14.1, Aluminum 10.6, Bananas 9.2, Fish 7.3, Wool 6.9, Crude oil 5.5, Wood pulp 5.3

Table A.8: Commodity specialization pattern for resource dependent HICs

2. Determinants of fiscal procyclicality in resource dependent countries

2.1. Introduction

Resource dependent economies face a bulk of macroeconomic challenges (exhaustibility of natural resources, intergenerational equity, Dutch disease phenomenon) inside which macroeconomic stabilization regarding commodity prices fluctuations remains only one element.

While their natural resource endowment should be a road to prosperity, historical experience has failed to match this view, which incited Richard Auty (1994) to develop the concept of resource curse. Indeed, commodity price booms are detrimental to economic growth in the long run even though they might have a positive impact in the short run (Collier and Goderis, 2007). As well as being detrimental to social welfare (Loayza et al, 2007) and having a negative impact on long-run economic growth (Ramey and Ramey, 1995), macroeconomic volatility seems to be responsible for this curse (Van der Ploeg and Poelhekke, 2009). This stresses the importance of the proper economic policy response in order to limit these fluctuations.

After a pre-crisis decade trusting monetary policy as the most reliable instrument of economic policy driving the business cycle, the huge coordinated fiscal policy response provided by the main governments during the economic crisis in 2009 tells us that the fiscal policy instrument is far from being outdated and is still an important tool in order to stabilize economic shocks. In addition, more and more developing economies have implemented an exchange rate arrangement fixer and fixer with a progressive capital account liberalization, which limits the action of monetary policy aiming at stabilizing the economy, and thus provides a more important role for fiscal policy.

As a result, an optimal fiscal policy whose goal is to limit economic shocks would be expansionary during downturns and contractionary during upturns. Such a policy would be considered as countercyclical contrary to a procyclical policy which would follow the business cycle and exacerbate economic fluctuations. Even though the fiscal policy response of 2009 turned out to be more or less expansionary, few countries in the world have implemented a countercyclical fiscal policy over a long period[9]. If the optimal fiscal policy would be countercyclical, we might wonder why few countries respond inversely to the economic cycle.

One potential explanation puts the emphasis on political pressures and distortions which gets the government to increase expenditures during periods of strong economic growth. In the case of a volatile economy, voracity effects (Tornell and Lane, 1999, Talvi and Vegh, 2005) and rent-seeking behaviors (Ilzetzki, 2011) provide relevant explanations of such pattern. Conversely, a country facing strong financial constraints, such as a limited access to international capital markets (Kuralbayeva, 2013) or a lack of credibility towards creditors would be less willing to implement a contractionary fiscal policy during downturns.

[9] As evidenced by Frankel (2013) more and more developing countries provided a countercyclical fiscal policy over the last few years than it used to be a couple of decades ago.

Over the past few years many empirical papers have provided evidences regarding the determinants of fiscal procyclicality in developing countries, while studies relying only on resource dependent countries are scarce. The importance of political-economy and financial constraints arguments have been broadly studied in the literature, but there is a lack of empirical evidence assessing alternative explanations such as the pattern of resource specialization and macroeconomic volatility, the implementation of fiscal rules, natural resource and non-resource sovereign wealth funds, or IMF lending arrangements. Hence beyond the two main factors discussed previously, this study includes an assessment for these alternative explanations as potential drivers of fiscal procyclicality in good and/or bad economic periods on a sample of resource dependent countries. This would enable us to have a synthetic look at the relative relevance for all these potential drivers of a procyclical behavior, facing the lack of empirical papers on this topic[10].

In order to fill this gap in the literature, this study takes into account different types of explanations (political-economic arguments, financing constraints, macroeconomic environment, fiscal rules, sovereign wealth funds, IMF lending arrangements) and assesses their relevance as determinants of a procyclical fiscal policy in good and/or bad economic periods. Relying on GMM estimations in order to tackle the endogeneity of our variables on a sample of 81 resource-rich countries between 1992 and 2012, we find suggestive evidence of a significant impact of sovereign wealth funds in lowering fiscal procyclicality while fiscal rules seem at best to have been non-effective.

In addition, few empirical studies focus on resource dependent countries, yet the most sensitive to the problem of macroeconomic stabilization. This empirical work aims at filling this gap focusing only on a sample of countries noticeably dependent on natural resources. Those countries do not belong to a homogeneous group because they differ regarding their level of economic development, the strength of their institutions, their specialization pattern, as well as their degree of exposure to external shocks, which provides a heterogeneous sample enabling us to evidence different factors driving toward a procyclical fiscal policy.

After a review of the literature in section 2.2, section 2.3 will present the data and some key stylized facts. Then, section 2.4 will present the empirical strategy and section 2.5 will cover all the data sources used for this study. Section 2.6 will feature our main empirical results which will trigger a conclusion in section 2.7.

2.2. Literature review

The optimal fiscal policy response towards the economic cycle opposes two strands of the literature: On the one hand, a Keynesian policy aims at smoothing intertemporal consumption while responding countercyclically to economic fluctuations. On the other hand, a neo-classical policy built on the tax rate smoothing theory a la Barro (1979) according to which tax rates should be kept constant in the economy as long as external shocks are seen as temporary and non-permanent. However, two more recent papers, Christiano et al (2011) and Nakata (2016) show that a countercyclical fiscal policy is socially optimal in a sticky-price model.

[10] Lledo et al (2009) being one noticeable exception even though their focus is on sub-Saharan African countries.

2.2.1. Cyclicality of fiscal policy

The first empirical study evidencing a more procyclical fiscal policy in developing countries dates to Gavin and Perotti (1997) in the case of America Latina. This result has then been extended to all developing countries (Lane 2003, Kaminsky et al 2005, Talvi and Vegh 2005).

Kaminsky et al (2005) emphasize the importance of assessing fiscal cyclicality thanks to a budgetary aggregate which consists in a real instrument under the direct control of the government. This tends to keep aside aggregates including revenues because they fluctuate regarding economic fluctuations so independently of any discretionary policy. These authors also warn against using variables scaled to GDP to study the cyclical pattern of fiscal policy because of the difference between fiscal and economic cycles which drives the cyclical coefficient blurred and tough to interpret. One solution would be the use of tax rates data, but these are often non available[11][12]. However, the more convenient solution remains to analyze the cyclical behavior of public expenditures, which will be shared by most of the following studies.

One common drawback to these past studies is the lack of empirical strategy to tackle the endogeneity bias arising from reverse causality through the fiscal multiplier channel. Following a remark from Rigobon in Kaminsky et al (2005), Jaimovich and Panizza (2007) introduce an instrumental variable to tackle this bias. This instrument is a weighted average of trading partners economic growth weighted by their relative importance in the exports of the considered country. They seem to call into question the previous results as they state that fiscal policy would have been procyclical because of the absence of correction of the reverse causality bias in former empirical studies.

Using a bunch of specifications and instrumentation strategies, Ilzetzki and Vegh (2008) provide empirical evidence that fiscal policy has been procyclical in developing countries even after considering the reverse causality. As noticed above, the global trend for developing countries seems to be a graduation towards a more countercyclical fiscal policy as evidenced in Frankel et al (2013).

2.2.2. Determinants of fiscal cyclicality

Most of the empirical studies analyzing the determinants of fiscal cyclicality estimate cyclical coefficients thanks to individual-based equations and then regress these coefficients in a second step on a set of characteristics to determine whose ones are the most relevant (Lane 2003, Thornton 2008, Halland and Bleaney 2011).

An alternative strategy used in Aghion and Marinescu (2008) and Mpatswe et al (2012) consists in computing time-varying cyclical coefficients thanks to a local Gaussian-weighted OLS approach in order to get enough degrees of freedom.

[11] Vegh and Vuletin (2015) manage to evidence a more procyclical pattern of tax rate policy in developing countries.

[12] Kaminsky et al (2004) as well as Talvi and Vegh (2005) use the inflation rate as a proxy for the average taxation rate in the economy.

Taking advantage of the extended information in panel data, Lledo et al (2009) for sub-Saharan African countries and Erbil (2011) on a sample of oil-producing countries estimate an equation close to the one used in this study.

A first group of determinants gathers all the political-economy considerations who are particularly relevant in good economic periods when political pressures to overspend are the most salient. For instance, having set good quality institutions seems to be linked with a more countercyclical fiscal policy (Calderon et al 2004, Calderon et al 2010, Frankel et al 2013). However, evidences regarding the impact of democracy is mixed with Diallo (2009) and Thornton (2008) emphasizing the countercyclical effect of democracy while Halland and Bleaney (2011) find an opposite result.

Even though highlighted in Alesina et al (2008) for democratic countries, the corruption channel triggering a procyclical fiscal policy has been contested by Thornton (2008), while Halland and Bleaney (2011) confirm the importance of a direct impact of corruption in Alesina et al (2008) but do not find evidence of a joint effect of democracy and corruption.

Using the concept of voracity effect (Tornell and Lane, 1999) regarding political pressures on deciders aiming at increasing expenditures in order to satisfy different lobbies, Talvi and Vegh (2005) state that the conjunction of a volatile macroeconomic environment and political pressures at the tops of the business cycle may have been responsible for fiscal procyclicality in developing countries. Other political-economic explanations have also been put forward like rent-seeking behavior (Ilzetzki, 2011) or power dispersion (Lane, 2003).

A second commonly studied group of determinants include the financing constraints factors. These constraints are especially binding in the down phase of the business cycle when the country has a limited access to international capital markets (Riascos and Vegh 2003, Mendoza and Oviedo 2006), or a limited financial development (Caballero and Krishnamurthy, 2004).

While characteristics specific to resource dependence has been mostly overlooked, macroeconomic volatility seems associated with a more procyclical fiscal policy (Lane 2003, Talvi and Vegh 2005).

2.3. Data and stylized facts

2.3.1. Sample

This empirical study relies on the panel of 81 resource dependent countries whose selection criterion has been discussed in section 1.2. Appendix in section 2.8.1 reference the countries used depending on the empirical specifications, the level of economic development, and the specialization pattern.

2.3.2. Stylized facts on the pattern of resource dependence

While studying the government reactions to macroeconomic volatility, we should have a deeper look at commodity price fluctuations which represent a specific challenge in resource dependent countries.

In this study we rely on the sample described in section 1.4.2 which consists of 57 commodities including 32 food products, 6 raw agricultural materials, 15 mining products, and 4 fuel products.

A first naive approach would be to focus on commodity-specific resource price volatility in order to gauge the relative price instability of the different commodity types. Using a GARCH(1,1) model on monthly commodity prices over 1980-2012 we derive a commodity-specific volatility index derived from the mean absolute conditional standard deviation of the GARCH model. Conditional variance of a price series provides a useful indicator in order to assess the perception of price volatility ex-ante as opposed to a simple standard deviation which corresponds to ex-post volatility.

As visible on figure 2.1, it is difficult to identify one main commodity group whose price would be more volatile over the studied period, even though agricultural raw material prices seem to be less volatile. We should also notice that crude oil and gasoline are both among the most volatile commodities while natural gas stands among the least volatile ones.

While illustrative of commodity prices patterns, we must complement this first picture with a more country-focused view. As a result, we compute country-specific commodity price indices (CSCPI) which is a standard measure in the literature of commodity price fluctuations faced by a commodity producer. This index is computed as a geometric average of the 57 commodity prices weighted by their mean relative importance of each commodity in the country's exports over 2003-2007. Section 1.4.3 has already provided descriptive tables which include these country-specific commodity weights for commodities whose weights exceed 5%.

In the same fashion as above, we derive country-specific mean absolute conditional standard deviations from a GARCH(1,1) model on each monthly CSCPI over 1980-2012. This index proxies the commodity price volatility faced by each country. As seen on figure 2.2, high income countries and upper-middle income countries seem to be more represented among the countries having faced the most commodity prices volatility. As such these countries would have been expected to suffer the most from this source of macroeconomic volatility. In this group of higher income countries, the bulk of them are also oil-producers which is consistent with the above analysis.

Figure 2.1: Mean absolute standard deviations issued from a GARCH(1,1) model on monthly commodity price indices over 1980-2012

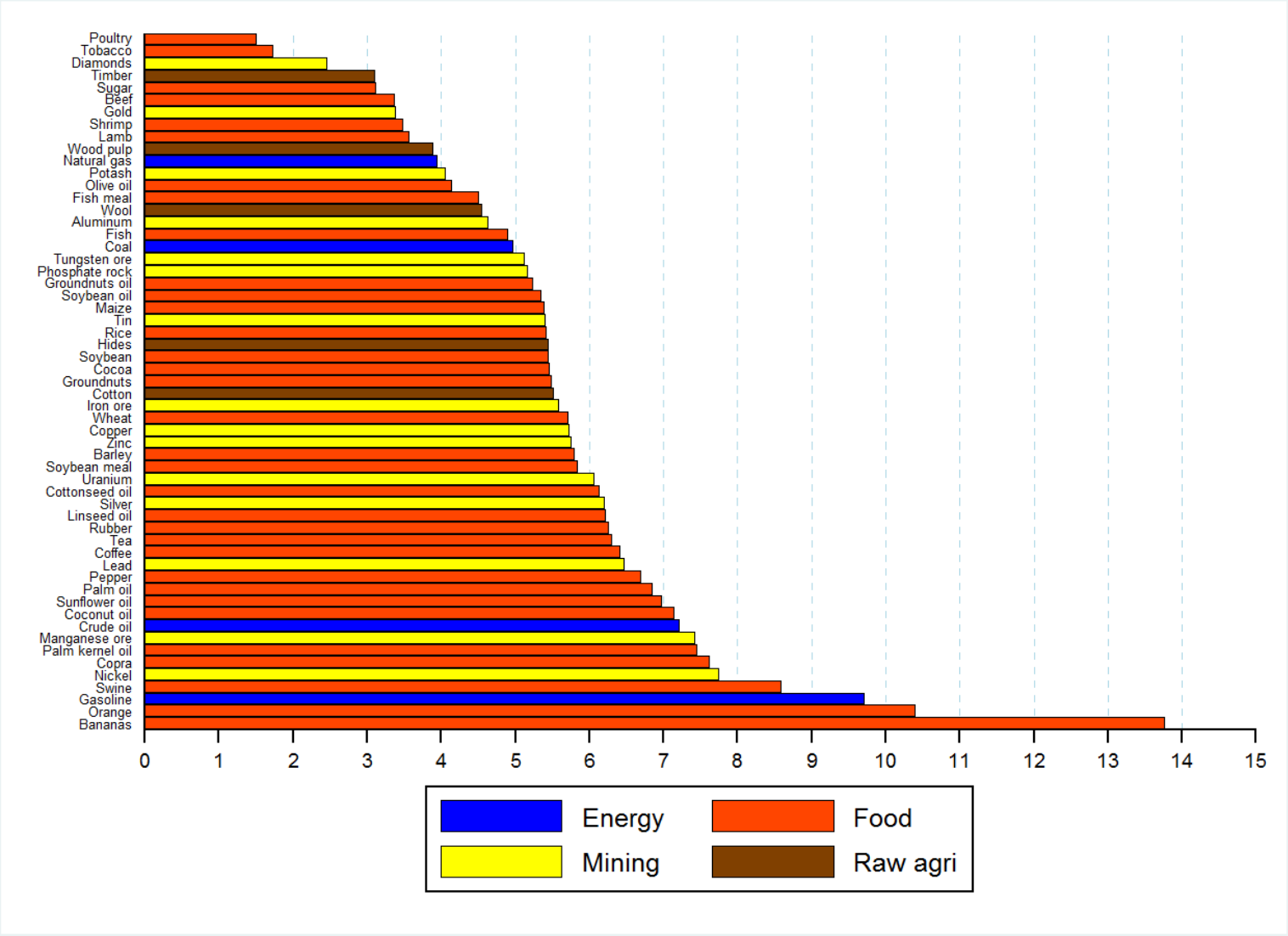
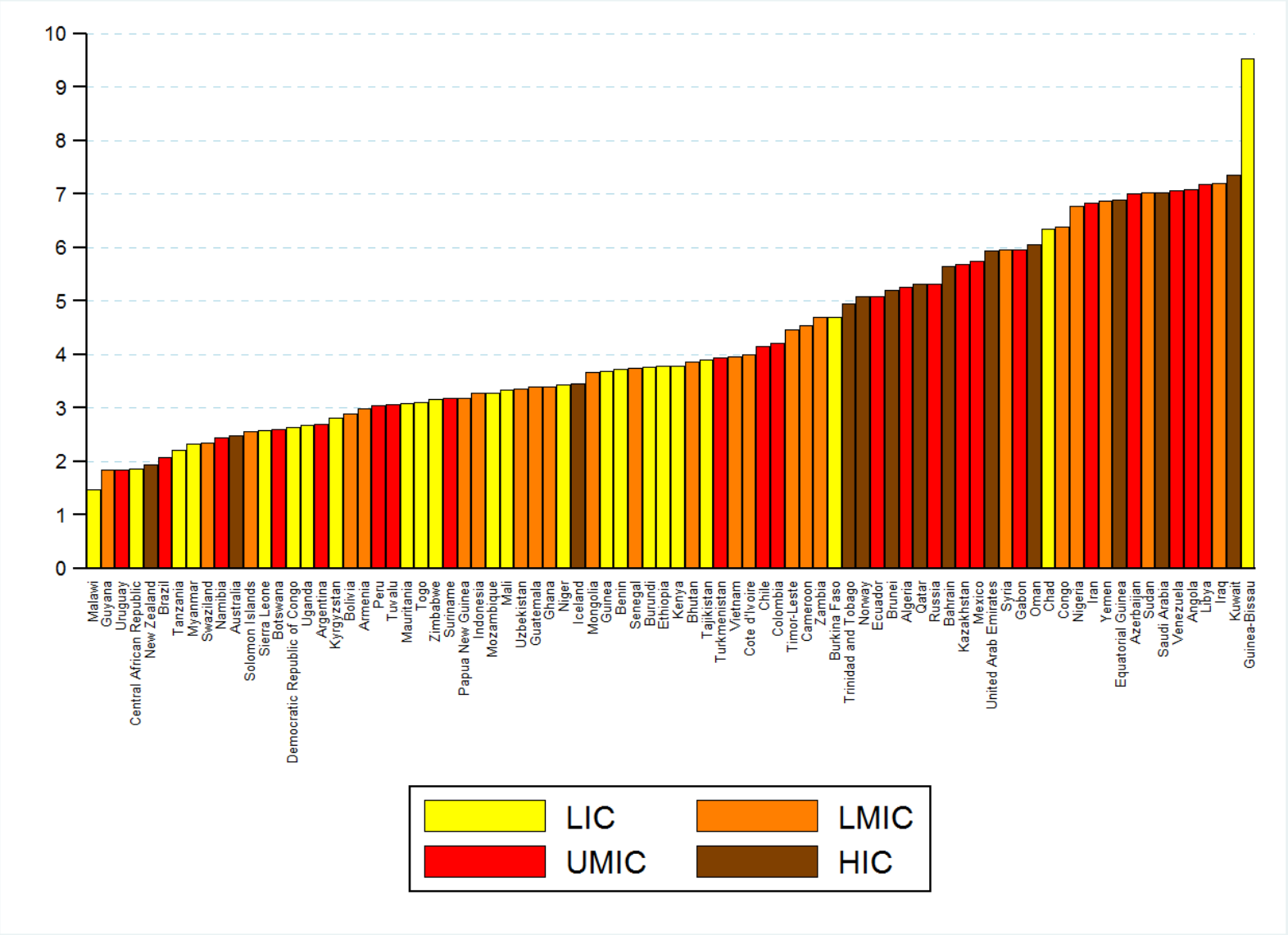


Figure 2.2: Mean absolute standard deviations issued from a GARCH(1,1) model on monthly Country-Specific Commodity price indices(CSCPI) over 1980-2012



2.3.3. Stylized facts on fiscal cyclicality

While higher income countries and especially oil producers have faced more important commodity price volatilities we should consider if these countries also presented a more or less fiscal procyclical pattern.

A first view of this problem would be to compute simple mean correlation coefficients between the yearly growth rate of real total expenditure per capita and the growth rate of real GDP. We represent these raw fiscal cyclicality coefficients in figure 2.3 over the same period 1980-2012.

With this figure, it's clear that developing countries have been more willing to implement a procyclical fiscal policy over this period. Even though this result is standard in the literature, we should notice that this result also applies on a sample of countries whose specialization pattern make them sensitive to commodity price fluctuations. Thus, commodity price dependence itself doesn't seem to be responsible for this more procyclical pattern of the fiscal policy in developing countries.

In a recent article, Frankel et al (2013) evidenced the graduation of fiscal policy towards a less procyclical pattern over time. Restricting our time period to the beginning of the century, we provide a picture of the recent fiscal procyclical pattern. It should be noted that our results are not directly comparable with Frankel et al (2013) because they analyze the correlation between Hodrick-Prescott filtered values of public expenditures and GDP.

Restricting our sample to the period 2000-2012, we recognize partly a similar pattern with countries having implemented a countercyclical fiscal policy increasing from 22 to 27 as visible on figure 2.4. Among the newcomers, we identify 2 low income countries (Ethiopia and Uganda), 1 lower-middle income country (Syria), 3 upper-middle income countries (Botswana, Suriname, Namibia), and one high income country (Oman). Conversely, two lower-middle income countries (Mexico and Iran) have followed the opposite path towards a procyclical pattern.

When looking at the end of the distribution, the number of countries having implemented a very procyclical fiscal policy seems to have increased. If we consider the countries with a cyclical coefficient over 0.6, their number have increased from 6 (Gabon, Angola, Mongolia, Cote d'Ivoire, Uruguay, Libya) to 11(without Gabon but adding Kenya, Uzbekistan, Solomon Islands, Venezuela, Sudan, and Togo).

While developing countries may have graduated towards a more countercyclical pattern over time, our graphics show a more mixed pattern when restricting the analysis to resource dependent countries with heterogeneous paths at different ends of the distribution.

Figure 2.3: Correlation coefficients between the growth of real total expenditures per capita and real GDP growth over 1980-2012

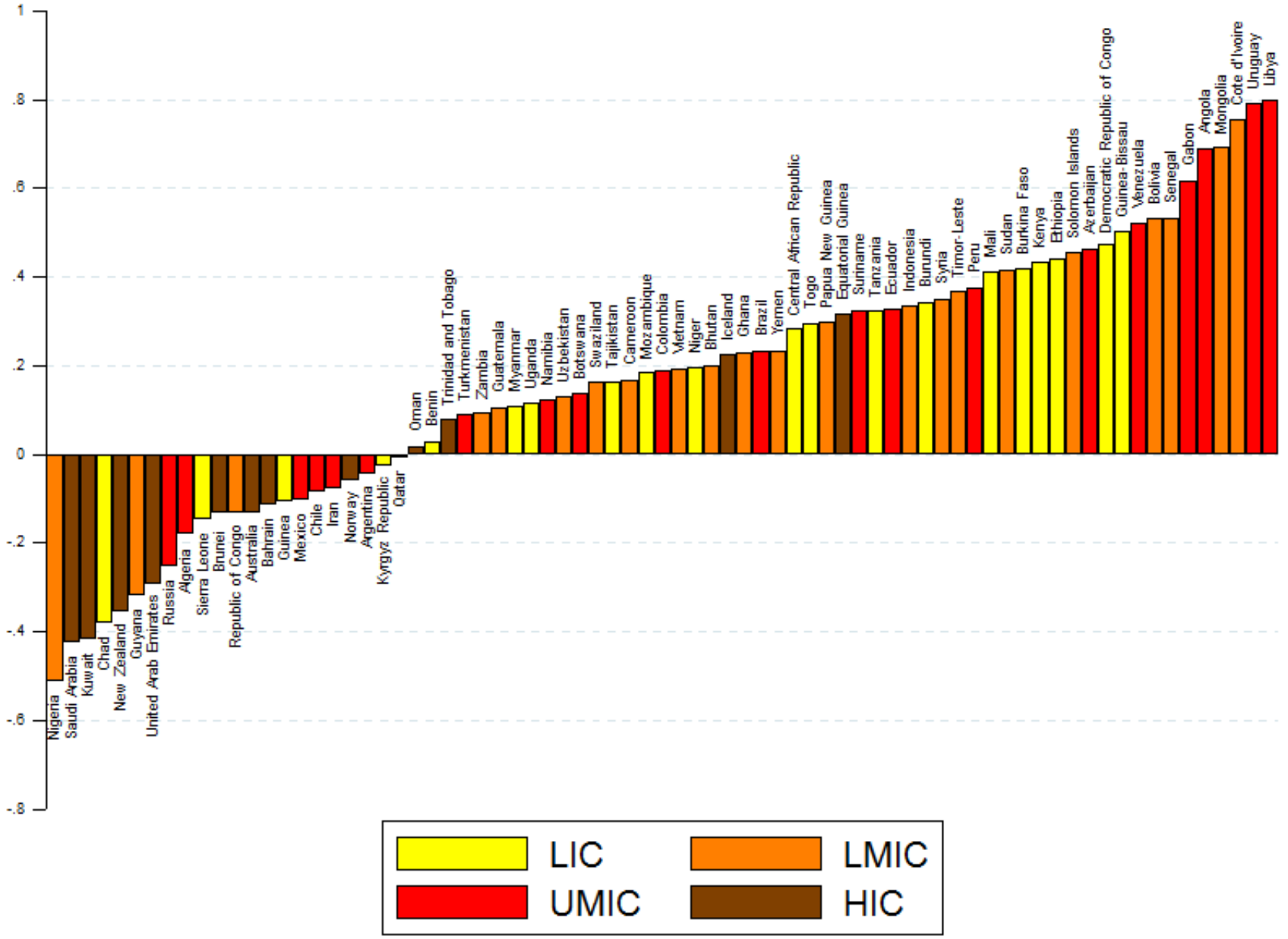
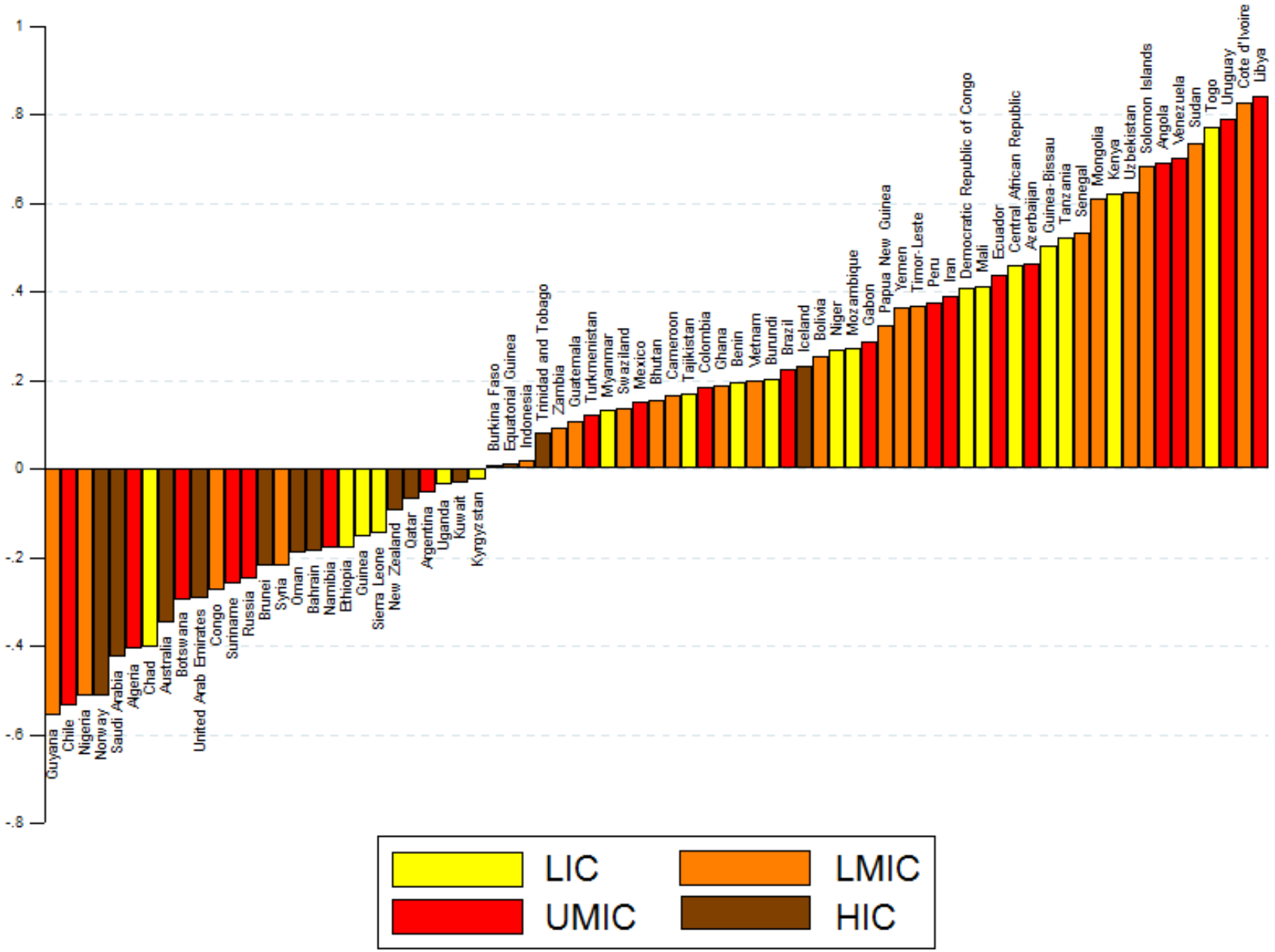


Figure 2.4: Correlation coefficients between the growth of real total expenditures per capita and real GDP growth over 2000-2012



2.3.4. Sovereign Wealth Funds in resource dependent countries

While a large amount of studies has covered the importance of institutional and/or political constraints in the upper parts of the business cycle as well as the relevance of budget constraints in the lower parts of the cycle, the literature is lacking additional assessments regarding sovereign wealth funds.

In this study we refer to the definition below of the Sovereign Wealth Funds Institute:

''A Sovereign Wealth Fund is a state-owned investment fund or entity that is commonly established from balance of payments surpluses, official foreign currency operations, the proceeds of privatizations, governmental transfer payments, fiscal surpluses, and/or receipts resulting from resource exports. The definition of SWF exclude, among other things, foreign currency reserve assets held by monetary authorities for the traditional balance of payments or monetary policy purposes, state-owned enterprises in the traditional sense, government-employee pension funds (funded by employee/employer contributions), or assets managed for the benefit of individuals.''

One of the main innovations of this paper is to gather some information regarding sovereign wealth funds. First, we relied on information from both the International Forum of Sovereign Wealth Funds and the Sovereign Wealth Funds Institute websites as starting points. Thanks to these sources we referenced 52 Sovereign Wealth Funds, but these were only representative of the current global landscape of sovereign wealth funds.

As a result, we used various data sources and country-specific IMF reports in order to complement the list. It resulted in the addition of 11 former funds which no longer operate. Our resulting list reported in section 2.8.2 includes 63 sovereign wealth funds in 39 countries from which only 7 manage wealth not originating from commodities. One advantage of this classification is to include former funds since we need to consider both successes and failures to gauge the whole story.

With the best of our available information, we defined 3 types of sovereign wealth funds depending on their mandate: stabilization funds, savings funds, and development funds[13]. We code a fund as having a stabilization purpose when its aim is to smooth the budget according to economic fluctuations or to act as an emergency buffer against a lack of government revenues. A fund has been tagged as a savings funds when its mandate includes intergenerational objectives, maximization of current wealth for future pension schemes financing, or other framework leading the entity to invest saved wealth in order to maximize its returns. Finally, we defined funds has development funds when their mandate explicitly included objectives of domestic investment support, promotion of long-term domestic growth, or alternative domestic expenditure schemes.

[13] It should be stressed that some funds have multiple objectives so that some funds can be coded for instance as stabilization and savings funds.

2.4. Empirical strategy

2.4.1. Empirical specification

We start from a Taylor-type reaction function of fiscal policy in which the government determines the level of expenditures per capita in order to minimize fluctuations regarding both GDP and terms of trade variations.

$$G_{i,t} - G_i^* = \alpha_0 + \alpha_1\left(G_{i,t-1} - G_i^*\right) + \alpha_2\left(Y_{i,t} - Y_i^*\right) + \alpha_3\left(ToT_{i,t} - ToT_i^*\right) + (\alpha_4 D_{2009} + \alpha_{5i})t + \mu_{it} \quad (1)$$

Some might wonder why we introduce some country-specific fixed effects α_{5i} as determinants of the trend of our expenditure variable and not as determinants of the level of expenditures. As pointed out by some authors (Arze del Granado et al 2013, Lledo et al 2009 and 2011) we might think of unobserved country-specific features which trigger the average path of expenditure growths[14].

We introduce a dummy variable for the year 2009 to consider the specific fiscal response related to the global financial crisis which led most countries to react to the crisis by a fiscal stimulus countercyclically[15].

Using a log-transformation of equation (1) we obtain the equation (2).

$$\ln\left(\frac{G_{i,t}}{G_i^*}\right) = \alpha_0^{'} + \alpha_1^{'}\ln\left(\frac{G_{i,t-1}}{G_i^*}\right) + \alpha_2^{'}\ln\left(\frac{Y_{i,t}}{Y_i^*}\right) + \alpha_3^{'}\ln\left(\frac{ToT_{i,t}}{ToT_i^*}\right) + \left(\alpha_4^{'}D_{2009} + \alpha_{5i}^{'}\right)\ln(t) + \mu_{\mathrm{i,t}}^{'} \quad (2)$$

Using the first differentiation of equation (2) we get our main empirical specification. It expresses the log-differenced real total expenditures per capita as a function of the lagged log-differenced dependent variable, the log-differenced real GDP, the log-differenced terms of trade, as well as a dummy for the year 2009 and country-specific fixed-effects.

$$\Delta\ln(G_{i,t}) = \alpha_1^{''}\Delta\ln(G_{i,t-1}) + \alpha_2^{''}\Delta\ln(Y_{i,t}) + \alpha_3^{''}\Delta\ln\left(ToT_{i,t}\right) + \alpha_4^{''}D_{2009} + \alpha_{5i}^{''} + \mu_{i,t}^{''} \quad (3)$$

Let's assume that some time-varying factors are driving the cyclical pattern of fiscal policy. If such factors would exist, they might influence both expenditure growth and the fiscal response to the business cycle. As a result, we introduce a variable $F_{i,t}$ which represent our potential determinants of fiscal cyclicality as well as an interaction term between this variable and the log-differenced real GDP so that we get equation (4):

$$\Delta\ln(G_{i,t}) = \beta_1\Delta\ln(G_{i,t-1}) + \beta_2\Delta\ln(Y_{i,t}) + \beta_3 F_{i,t} + \beta_4 F_{i,t} * \Delta\ln(Y_{i,t}) + \beta_5\Delta\ln\left(ToT_{i,t}\right) + \beta_6 D_{2009} + \beta_{7i} + \varepsilon_{it} \quad (4)$$

[14] In the context of resource dependent countries, features related to the commodity specialization pattern, or proven reserves of natural resources may drive the average path of expenditure growth.
[15] This will prevent us from including time-fixed effects as discussed thereafter.

While controlling for the direct response of expenditure growth to economic growth fluctuations and our variable $F_{i,t}$, our main interest relies on studying the coefficient β_4 in equation (4). A significant positive coefficient would mean that our candidate variable $F_{i,t}$ would significantly be associated with a more procyclical (or less countercyclical) behavior of fiscal policy, while a significant negative coefficient would associate this variable to a less procyclical (or more countercyclical) pattern.

In order to get an assessment of the relevance of the interaction term introduced, we provide for each specification a Wald test of joint non-significance of the coefficients β_2, β_3, and β_4. As a result, if we fail to reject the joint non-significance hypothesis, we should not rely on the interpretation of our main coefficient β_4 because it would signalize a misspecification of our empirical equation.

As stated previously, we take the opportunity of this study in order to assess the relevance of 7 groups of determinants triggering fiscal cyclicality in resource dependent countries. These groups and the variables inside are referenced in Table 2.1 below.

Political economy	Financing constraints	Resource dependence
Polity fragmentation	Reserve assets/months of M	Commodity exports(%GDP)
Democracy	Net private capital flows/cap.	Commodity rev. (total rev.)
Executive constraints	(External debt/cap.)$^{-1}$	Hydrocarbon rev. (%total rev.)
State fragility	Openness of capital account	Commodity exports(%GDP)*vol(commodity prices)
Absence of political rights	Fixed exchange rate	Commodity exports(%GDP)*vol(commodity prices)$^{-1}$
Absence of civil rights	Financial development	
Good governance	Net (ODA/cap.)$^{-1}$	
Years of the executive		

Sovereign Wealth Funds	Fiscal Rules	Features of Fiscal Rules	IMF lending arrangements
SWF	Fiscal Rule	FR + Stabilization	IMF lending arrangement
Years since SWF	National Fiscal Rule	FR + Investment excl.	Stand-by arrangements
Stabilization SWF	Supranational Fiscal Rule	FR + Fiscal Responsibility Law	Extended Fund Facility
Development SWF	Years since Fiscal Rule	FR + Escape clause	Extended Credit Facility
Savings SWF	Expenditure Rule	FR + Formal enforcement	
	Budget Balance Rule	FR + Cov. at gen. gov. level	

Table 2.1: Potential determinants of fiscal cyclicality covered in this study

2.4.2. Econometric framework

Because our empirical specification is a dynamic panel equation, we should use an estimator taking into account such a framework. As a result, we rely on a difference-GMM framework introduced by Arrelano-Bond (1991) which consists of instrumenting our endogenous variable with values at least lagged from two periods of this variable. One weakness of this estimator is the weak instrument bias when past values of our endogenous variable are weakly correlated with our endogenous variable. To tackle this problem, Blundell and Bond (1999) estimate a two-equation model called the system-

GMM which relies on instrumenting a first-differenced equation with past values of the endogenous variable in level, and instrumenting a level equation with past values of first-differenced values of the endogenous variable. While this estimator may correct the weak instrumentation problem, it relies on the strong assumption of no-correlation between our first-differenced instruments and the error term in the level equation. As noticed by Roodman (2009), this assumption is often misleading which induced Lledo et al (2009 and 2011) to prefer the Arrelano and Bond (1991) estimator. We follow this intuition and rely on the difference-GMM estimator instead of the system-GMM.

While the use of the GMM framework on a dynamic panel was intended to provide estimates for microeconomic panel data[16], it has been widely used over the last decade in macroeconomic empirical papers despite the low cross-section dimension and high time coverage[17]. To limit such problem, we keep the highest number of countries possible for our specification while restricting our time coverage. As a result, we provide estimates on a sample of 77 resource dependent countries restricted to the period 1992-2012.

Another common problem with the use of the GMM framework in such context is the problem of over-instrumentation emphasized by Roodman (2009). Adding too much instruments in the framework result in biased estimates of the Hansen test[18] of instrument exogeneity[19].

While it's commonly advised to introduce time fixed effects as instruments in the framework, we preferred not to include them because this would introduce too much instruments in the model. While we should always keep the number of instruments well below the number of cross-sections in the panel data, introducing time fixed effects will automatically prevent us from using enough lags of our variables as internal instruments without biasing the statistic of the Hansen test[20].

In order to provide some consistence to our results we will keep the same GMM framework for every empirical specification. We treat the log-differenced real GDP as well as our interaction variable as endogenous variables, the lagged log-differenced real expenditure per capita and our determinant of fiscal cyclicality $F_{i,t}$ as predetermined variables, while terms of trade variations and the dummy for 2009 are used as exogenous instruments. When we will introduce control variables in our robustness check, we will consider both the inflation rate and trade openness as predetermined variables, while the election dummy, trade openness, the urbanization rate, and the dependency ratio will be treated as exogenous.

In unreported estimates we introduced the external instrument developed by Jaimovich and Panizza (2007) which is the weighted average economic growth of the top 10 country's partner weighted by

[16] A microeconomic panel, as opposed to a macroeconomic panel, is a panel with a high number of individuals as compared to the number of time periods. Such panel data rely on three assumptions: stationarity of the variables, cross-section independence, and homogeneity over time of estimated coefficients.
[17] To tackle this problem some authors used 3 or 5 years mean of each variable in order to limit the time-dimension of their data, but such an approach would not be relevant in our case.
[18] We can't rely on the Sargan statistic in order to assess the exogeneity of our instruments because it is not robust to heteroskedasticity even though it is not biased with the number of instruments.
[19] The number of instruments quickly explodes in the case of system-GMM which is a further argument for using difference-GMM instead. The magnitude of the Hansen test P-Value gives a first look at the overinstrumentation problem with P-Values equal to 1 often the sign of a biased statistic more than a check of exogenous instruments.
[20] The inclusion of the dummy for the year 2009 may already catch the most relevant global macroeconomic shock which would have impacted most resource dependent countries over this period. Besides there may not be relevant arguments for global common shocks for every resource dependent country which would impact the growth rate of expenditures apart from economic growth and terms of trade fluctuations.

their relative importance in the country's exports[21]. However, such an instrument triggers some theoretical problems because the increase of partners growth may impact directly the country's expenditure growth through the export's taxation channel independently on GDP growth. While exports taxation has nearly disappeared among sub-Saharan African countries over time (Keen and Mansour, 2007), it remains relatively salient in Latin America. Besides, when the United States are beyond the main trading partners, they can still influence the interest rate on other countries debt obligations through the monetary policy of the Federal Reserve[22]. When running estimates including this instrument, the Hansen test rejected the exogeneity of our instrumentation which confirmed our initial worry.

We will keep the same lag specification all along the study in order to provide consistent estimates. As a result, we restrict the instrument matrix to the first lag of our predetermined variables[23], while we do not put any restriction on the number of selected lags for our endogenous variables. In order to limit the number of instruments we will collapse the selected instrument matrix in order to keep fewer instruments.

Besides the P-Value of the Wald test of joint non-significance of the 3 coefficients related to the interaction term, we have performed for each specification the standard GMM tests and we report the P-Values for the absence of second-order serial correlation test and the Hansen test of non-weak instruments.

In order to get a more accurate view of what lies behind any cyclical behavior, we run each specification on 3 different samples: a full sample with every observation, a sample with observations corresponding to good economic periods, and a sample for bad economic periods. In order to split the sample, it is often advised to use statistical filters such as Hodrick-Prescott or Baxter-King in order to identify good or bad economic outlook depending on filtered values of GDP growth. However, the use of statistical filters can induce some troubles in the analysis because developing countries and to a better extend resource dependent countries may follow a stochastic trend in their GDP growth (Aguiar and Gopinath, 2007) as well as a heterogeneous speed of adjustment towards their long-run path. Thus, we prefer splitting the sample between observations which exceed the country-specific median of the log-differenced real GDP and the others.

2.5. Data sources

The use of quarterly data would be preferable in order to tackle the reverse causality (Ilzetzki and Vegh, 2008). Nevertheless, our sample covers a lot of countries whose data are only available on a yearly basis.

With a lack of country coverage for some of our main macroeconomic variables in the 1980s, we restrict our sample to the period 1992-2012. This will allow us to include more countries in the

[21] We relied on DOTS data over 2003-2007 to derive these weights and made their sum equal to 1 for each country.

[22] This point only applies when assessing expenditures including debt interest payments as it is the case for total expenditures.

[23] We refer to our potential determinant of fiscal cyclicality as a predetermined variable because in most of the cases it would at most be impacted by public expenditures in the long run but not contemporaneously, while the interaction term is considered as endogenous because of the contemporaneous reverse causality between GDP and expenditures.

analysis as well as to limit the non-stationarity of our variables which is a key assumption for our GMM framework. The data sources of our variables are described in section 2.8.3 while section 2.8.4 provides descriptive statistics of these variables.

Our main fiscal aggregate is real total expenditure measured at the general government level (WEO) and scaled by the number of inhabitants (WDI). While often overlooked or added at most as a control variable, the country population enables to control for the demographic dynamism of some developing countries. A lot of studies use the ratio of fiscal variables over GDP, but such aggregates may introduce some computation errors in the analysis because of the difference between the fiscal and the economic cycles (Kaminsky et al, 2005).

As a result, we use our expenditure variable per capita because some key components of expenditure such as social, health, or education expenditures are directly scaled depending on the number of inhabitants. In countries with a strong demographic dynamism, the use of the growth rate of an unscaled variable risk to introduce a bias. Alternatively, we are using real primary expenditure per capita which subtracts from total expenditure the total debt service (WEO)[24] .

Regarding our business cycle variable, we use the real level of GDP (WEO) instead of GDP per capita because the growth of GDP is a key variable in the economic decision process and thus more willing to serve as a reference for fiscal reaction than GDP per capita.

Among our control variables, we introduce a dummy variable for years of executive election (World Bank Database on Political Institutions), the rate of inflation (WEO), the urbanization rate (WDI), the dependency ratio (WDI), as well as trade openness (WEO)[25].

Data regarding our monthly and yearly commodity prices are taken from IFS and complemented by data from UNCTAD, and Bloomberg for diamonds. Commodity exports data are also from UNCTAD and complemented when necessary with COMTRADE data for the period 1992-1995, relying on the third revision of the SITC.

Fiscal commodity or hydrocarbon revenue variables have been constructed from the commodity related revenues from WEO, from data in Villafuerte and Lopez-Murphy (2010), and complemented by IMF (2012), as well as various IMF country reports.

Data regarding fiscal rules originate from the IMF Fiscal Rules dataset (2013) as described in Schaechter et al (2012)[26]. Data regarding sovereign wealth funds are from different sources and discussed deeper in the appendix.

The political fragmentation variable is a variable from 0 to 3 which catches the fragmentation of the political process at the territory level which escapes from the government control (Polity IV). Our index of democracy is the polity2 variable of the Polity IV which is coded from -10 for fully autocratic governments to +10 for fully democratic governments. The index of the constraints on the executive is also from the Polity IV database and coded from 1 (unlimited authority) to 7 (Executive parity or subordination). The number of years since the executive came to power also originates from the Polity IV database.

[24] Taking into account both interest and amortization paid.
[25] Trade openness is computed as the sum of goods and services exports and imports measured at the Balance of Payment level and scaled over GDP.
[26] A fiscal rule is defined as a permanent constraint over a budgetary aggregate who takes the form of a numerical limit, as defined by Kopits and Symansky (1998).

The state fragility index is coming from the Center for Systemic Peace database and code state institutions from 0 to 25, a higher score corresponding to more defective institutions.

The indices of the absence of civil rights and of political rights come from Freedom House and are coded from 1 to 7, a higher value corresponding to a lower degree of freedom. Regarding the variable of good governance, we use the corruption indicator from the Worldwide Governance Indicator who takes values from -2.5 for weak governance to 2.5 for better governance.

The variable related to reserves correspond to official reserves as reported by the IFS and measured in number of months of imports of goods and services measured at the Balance of Payment level (WEO). Data regarding net private capital flows per capita and total external debt per capita also arise from the WEO.

The openness of the capital account is proxied thanks to the Chinn and Ito financial openness index 2011 which was introduced in Chinn and Ito (2006). Regarding financial development, we use the ratio of liquid liabilities (Global Financial Development Database, World Bank) scaled by the number of inhabitants and not the GDP to avoid blurred results due to the volatility of economic cycles in our sample.

Our dummy variable of fixed exchange rate regime has been computed thanks to the de facto classification in Ilzetzki et al (2011). I have considered a fixed exchange rate regime for categories 1 (de facto peg), 2 (de facto peg with a crawling band that is narrower or equal to +/- 2%), while considering categories 3 (Managed floating) and 4 (Freely floating) has flexible regimes. Categories 5 (Freely falling) and 6 (Dual market) has been excluded and coded as missing data.

The variable related to official development assistance consists of net received ODA per capita and is coming from the WDI.

A dummy has been coded taking the value of 1 when a country is under at least one official lending arrangement with the IMF for at least one month in the current year and 0 otherwise, thanks to information publicly available on the internet website of the institution. Lending arrangements are programs approved by the IMF executive board and providing some disbursements to the signatory country as long as the government specific conditionalities. We report dummy variables for the most applied programs over the time period, namely the Stand-By Arrangement (SBA), the Extended Fund Facility (EFF), and the Extended Credit Facility (ECF)[27].

As discussed previously, our country specific commodity price index (CSCPI) is a weighted average of commodity prices weighted by their relative importance in commodity exports of each country. This index is then multiplied by the ratio of commodity exports at the broad sense of the standard classification over GDP in order to get a variable who takes into account the changing importance of commodity reliance over time, under the implicit assumption that the specialization pattern inside the commodity sector stay identical to the one computed for the reference period 2003-2007[28].

In the fashion as above, the index of the commodity price volatility faced by the government is computed thanks to a GARCH (1,1) model on the previously defined CSCPI. This corresponds to the

[27] The other IMF lending arrangements covered in our main dummy variable are the Flexible Credit Line (FCL), the Precautionary and Liquidity Line (PLL), the Stand-by Credit Facility (SCF), the Structural Adjustment Facility Commitment (SAFC), and the ESF (Exogenous Shock Facility). Extended information regarding these programs is available on the website of the IMF.

[28] Computation of such an index is standard in the literature (Deaton and Miller 1995, Dehn 2000, Collier and Goderis 2007, Medina 2010, Guérineau and Ehrart 2013) even though some variations exist among authors.

absolute conditional standard deviation issued from this GARCH(1,1) model multiplied by the time-varying ratio of commodity exports over GDP.

We also gathered countries among income groups thanks to the available WDI (2012) classification.

2.6. Empirical results

We estimate a common empirical specification thanks to the GMM framework discussed above. The only variation among the following regressions is the determinant of fiscal cyclicality that we introduce both alone in the regression and as an interaction with the difference-log of real GDP per capita.

We consider a potential determinant as relevant when the interaction term is significantly different from 0 and when the Wald test rejects the non-joint significance of the three coefficients related to the interaction.

The results tables will be presented including the value and significance of each interaction terms as well as the standard statistics related to a GMM framework, and the P-Value of the Wald test. Each column corresponds to a regression with an alternative determinant of fiscal cyclicality and presents results estimated on the whole sample, for good economic periods, and for bad economic periods[29].

2.6.1. Political economy determinants

The first group of potential determinants of fiscal procyclicality includes a set of variables linked to political economy considerations whose results are reported in table 2.2.

The polity fragmentation of the political power seems to be linked to a more procyclical behavior of expenditures in good economic periods. This variable catching the importance of the decisional process which escapes from the government independently of any formal agreements[30], it may illustrate the competition between the government and the autonomous entities which could lead the government to overspend in good economic periods in order to keep the social peace. An alternative explanation could consider autonomous entities as pressure groups the government has to content when the economy is in the upper part of the business cycle which leads it to increase its expenditures.

The impact of democracy on the cyclical behavior is a mixed result in the literature as stated previously. While democracy doesn't seem to be an important factor all along the business cycle, it seems at least to trigger a countercyclical behavior in good economic periods leading to reduce expenditures when the economy is booming. This result seems to emphasize the importance of democratic institutions in order to limit the overspending bias of expenditures in good economic periods.

[29] Good and bad economic periods are split according to the country-specific median of the growth rate of real GDP.

[30] The most common case is the one of an autonomous territorial entity in which the government can't effectively implement its policy.

While the previous result could suggest an importance of constraints on the executive power in order to prevent some expenditure growths in periods of good economic outlook, the variable proxying the constraints on the executive fails to be significant even though the coefficient is negative.

The state fragility index is a synthetic index measuring both the legitimacy and the effectiveness of the government on 4 fields: security, polity, economy, and social. Even though we could have expected to see such "fragile states" willing to overspend in good economic periods, we do not find any significant effect in our sample.

We now focus on the two indices from the Freedom House, namely the absence of political rights and the absence of civil rights, the former taking into account the electoral process, political pluralism and participation, as well as the functioning of the government; while the latter covers the freedom of expression and belief, associational and organizational rights, the effectiveness of the rule of law, and personal autonomy and individual rights.

Both indices seem related to a more procyclical behavior all along the business cycle but are no more significant when restricting the sample. As such it stresses the importance of political rights in order to enable some competition in the political process and make the government accountable, while also emphasizing the necessity of civil rights in order to provide a counter-power which could provide some checks and balances through the civil society.

The index of governance is the control of corruption from the Worldwide Governance Indicator. A country which managed to control its corruption seems to have implemented a significantly more countercyclical fiscal policy. The coefficient is significantly negative for the whole sample and bad economic periods, but also of the same magnitude for good periods even though it is not significant. This result triggers the importance of controlling corruption in resource dependent countries. The significance of our result for bad and not for good economic periods could mean that the control of corruption channel give a better access to external financing sources in periods of bad outlook because it gives the vision of an accountable and reliable government, even though the effect could arise solely from the effectiveness of the fiscal management all along the business cycle.

Unlike a common wisdom would suggest, executives who are in place since a longer period have been more willing to implement a countercyclical fiscal policy through a limitation of expenditure growth in good economic periods. We may have expected that a government in place for too long could be willing to rent-seeking behaviors which could lead to overspend in order to stay at the power. A potential explanation for the present result could be that resource dependent countries are more willing to instability because of the political competition to control natural resources and to beneficiate from the rent. Finding a balance to keep the peace and limit social unrest could be a difficult equilibrium in these countries which could explain why governments which stayed the longest have been the most fiscally accountable. An ultimate explanation could arise from the electoral cycle which make political deciders more willing to overspend at their arrival in order to content their supporters even when the deciders arrived through a coup.

	Polity fragmentation	Democracy	Executive Constraints	State Fragility	Absence of Political Rights	Absence of civil rights	Good governance	Years executive
Total								
Δln(GDP)*F	0.395 (1.144)	-0.060 (-1.482)	-0.157 (-0.852)	0.061 (1.192)	0.253** (2.564)	0.287*** (2.679)	-0.638* (-1.768)	-0.026** (-2.421)
Number of observations	857	1097	1062	1047	1124	1124	979	1130
Number of countries	75	75	75	74	76	76	77	77
Number of instruments	33	40	40	38	40	40	35	40
AR(2) (P-Value)	0.066	0.537	0.441	0.989	0.407	0.612	0.524	0.399
Hansen (P-Value)	0.414	0.235	0.561	0.316	0.241	0.297	0.197	0.484
Wald (P-Value)	0.005	0.026	0.001	0.001	0.000	0.000	0.000	0.000
Good times : Δln(GDP)> median [Δln(GDP)]$_i$								
Δln(GDP)*F	1.492** (2.451)	-0.127** (-2.425)	-0.194 (-1.056)	0.083 (1.110)	0.052 (0.286)	0.280 (1.289)	-0.672 (-1.472)	-0.045*** (-3.445)
Number of observations	456	562	549	534	576	576	498	578
Number of countries	75	75	75	74	76	76	77	77
Number of instruments	33	40	40	38	40	40	35	40
AR(2) (P-Value)	0.238	0.430	0.562	0.584	0.415	0.390	0.639	0.620
Hansen (P-Value)	0.498	0.311	0.347	0.780	0.714	0.326	0.159	0.404
Wald (P-Value)	0.000	0.000	0.000	0.000	0.000	0.002	0.000	0.000
Bad times : Δln(GDP)< median [Δln(GDP)]$_i$								
Δln(GDP)*F	-0.263 (-0.832)	0.051 (1.076)	0.024 (0.228)	0.007 (0.143)	0.053 (0.390)	0.126 (0.863)	-0.535** (-1.979)	0.002 (0.224)
Number of observations	366	483	462	465	495	495	436	499
Number of countries	73	73	72	72	74	74	75	75
Number of instruments	33	40	40	38	40	40	35	40
AR(2) (P-Value)	0.143	0.517	0.315	0.305	0.148	0.271	0.625	0.255
Hansen (P-Value)	0.664	0.501	0.577	0.562	0.401	0.374	0.267	0.547
Wald (P-Value)	0.070	0.122	0.056	0.174	0.002	0.003	0.005	0.002

Table 2.2: Estimates of the empirical framework for political economy determinants

2.6.2. Financing constraints déterminants

While the previous results acknowledged the importance of political economy factors driving fiscal cyclicality especially in the upper phase of the business cycle, we turn our analysis into financing constraints arguments whose results are reported in table 2.3. It's striking to realize that none of them are significant in bad times even though we would have expected such determinants to operate through these periods.

The importance of official reserves could constitute a buffer under the use of the central bank in order to manage macroeconomic volatility when in accordance with its mandate. However, the importance of such buffers has not influenced the fiscal cyclical behavior. A first explanation could be that officials only keep the proper amount of official reserves in order to pay their imports in case of a sudden stop so that the importance of official reserves may not be influential. An additional explanation relies on the existence of sovereign wealth funds in several resource dependent countries which manage public wealth well beyond the amount of official reserves and which represent the real buffer against a potential change of the outlook.

The variable of net private capital flows also fails to be significant. The initial assumption was to consider net private capital flows as a potential indicator of alternative sources of financing which would have helped the government to cut its expenditures in the down phase of the business cycle.

As a key variable of fiscal sustainability, the lagged level of external debt per capita has not influenced the cyclical behavior of expenditures in our sample. We could have expected a government more obliged to make a drastic economic adjustment in case of a bad economic outlook because of the debt burden which could have limited the access to external sources to finance extra expenditures.

The openness of the capital account seems related to a more countercyclical path of expenditures in our sample especially through a limit to increase its spending in good times. As such it could mean that countries who opened the most their capital account have been more willing to implement sound fiscal policies following an openness of the capital account. While we could have expected it would have helped easing some financial constraints during slowdowns, we can see this result as a sign of the necessary soundness of economic policy when the capital account is open in order to prevent some sudden capital outflows.

The exchange rate regime does not seem to be especially influential on the cyclical behavior of expenditures. We could have expected a fixed exchange rate regime as a potential helper in case of potential pressures on the exchange rate markets during slowdowns. Another potential explanation would have been that a more flexible exchange rate would enable the government to manage a temporary recovery of their exports through a temporary devaluation or undervaluation of the national currency. The lack of evidence here calls further analysis on this question.

The impact of the financial development has not been significant on our sample while we could have expected more financially developed economies associated with a more countercyclical fiscal policy because it could have provided a domestic alternative from international capital markets to finance extra spending in bad economic periods.

Finally, lagged net official development assistance fails to significantly influence the cyclical pattern of fiscal policy. The initial idea was that some assistance could be provided to countries in exchange of some good economic policy soundness and management, but here this effect may not have significantly mattered.

	Reserves	Private capital flows	External debt $_{-1}$	Openness of capital account	Fixed ER	Fin. Dev.	Net ODA $_{-1}$
Total							
Δln(GDP)*F	0.001 (0.168)	-0.000 (-1.137)	-0.043 (-0.187)	-0.439** (-2.095)	0.455 (0.603)	-0.190 (-1.464)	0.004 (0.968)
Number of observations	1034	902	1064	1036	865	993	1136
Number of countries	73	63	74	76	76	76	77
Number of instruments	40	40	40	38	36	38	40
AR(2) (P-Value)	0.789	0.923	0.831	0.906	0.516	0.929	0.672
Hansen (P-Value)	0.494	0.626	0.838	0.073	0.260	0.434	0.387
Wald (P-Value)	0.000	0.009	0.000	0.000	0.006	0.000	0.049
Good times : Δln(GDP)> median [Δln(GDP)]$_i$							
Δln(GDP)*F	-0.003 (-0.456)	-0.000 (-1.154)	0.220 (0.869)	-0.406* (-1.745)	-0.288 (-0.273)	-0.064 (-0.382)	-0.001 (-0.200)
Number of observations	531	455	546	534	456	510	582
Number of countries	73	63	74	76	75	75	77
Number of instruments	40	40	40	38	36	38	40
AR(2) (P-Value)	0.374	0.314	0.389	0.475	0.610	0.464	0.629
Hansen (P-Value)	0.933	0.515	0.348	0.271	0.452	0.296	0.498
Wald (P-Value)	0.000	0.000	0.002	0.000	0.000	0.000	0.000
Bad times : Δln(GDP)< median [Δln(GDP)]$_i$							
Δln(GDP)*F	-0.009 (-1.071)	0.000 (0.859)	-0.208 (-1.141)	-0.116 (-0.542)	-0.515 (-0.595)	-0.040 (-0.280)	-0.002 (-0.510)
Number of observations	455	405	468	454	372	436	501
Number of countries	70	61	72	74	74	73	75
Number of instruments	40	40	40	38	36	38	40
AR(2) (P-Value)	0.291	0.529	0.437	0.617	0.288	0.551	0.331
Hansen (P-Value)	0.407	0.569	0.707	0.196	0.198	0.405	0.594
Wald (P-Value)	0.000	0.056	0.011	0.128	0.762	0.001	0.014

Table 2.3: Estimates of the empirical framework for financing constraints determinants

2.6.3. Resource dependence déterminants

The next family of potential explanations of the cyclical pattern of fiscal policy in resource dependent countries relies on the pattern of this resource dependence whose results are reported in table 2.4. One advantage of our sample is to include heterogeneous countries regarding their commodity specialization pattern so that we can gauge their potential influence in the story.

This section tries to complement the lack of evidence in the literature with most papers not going further than analyzing the impact of standard deviations from GDP growth (Lane 2003, Talvi and Vegh 2005).

Our first indicator catches the relative importance of a country's exposure to commodity price fluctuations through its exports. On the one hand more resource wealth can relax financial constraints for the government if he manages to collect and manage effectively resource revenues, but on the other hands excessive resource rents can be detrimental for the economy and deteriorate institutions and governance.

The two following columns analyze the potential impact of commodity and hydrocarbon revenues dependence. Due to the scarcity and potential unreliability of some revenue data we should not put excessive faith in the present results[31]. However, commodity revenue and especially hydrocarbon

[31] Besides the reduction of cross-sections increase the problems associated with difference-GMM estimates on a panel lacking cross-section dimension in comparison with the time dimension.

revenue dependence seems related with a more countercyclical path of expenditures even though this necessitates further analyzes. At most, we could imagine that countries the most dependent on commodities and hydrocarbons in our sample share some common features allowing them to run a less procyclical fiscal policy than the others.

Our last two columns use the volatility index described previously issued from a GARCH(1,1) model of our monthly CSCPI index. In these estimates we use annual averages of these absolute conditional standard deviations derived from this model and weighted with the time-varying share of commodity exports over GDP to consider the time-evolution in each country resource-dependence pattern.

Our volatility index may catch ex-ante volatility and thus be a sign of macroeconomic uncertainty faced by political deciders. While using contemporaneous or lagged volatility indices, it seems that governments having faced the most commodity price volatility have implemented a more countercyclical fiscal policy through a significant limitation of expenditure growth in good economic periods[32]. However, we previously recognized crude oil has one of the most price-volatile commodities over the last decades. Thus, our results could be driven by some oil-producers which managed to implement more countercyclical fiscal policies. An alternative explanation could be that countries facing more uncertainty regarding the future price of commodities have been more conservative regarding their expenditure growth even with a good economic outlook.

	Commmodity exports (%GDP)	**Commodity rev. (%total rev)**	**Hydrocarbons rev. (%total rev)**	**vol(CSCPI)**	**vol(CSCPI)$_{-1}$**
Total					
Δln(GDP)*F	0.001 (0.077)	-0.023* (-1.737)	-0.015 (-1.085)	-0.255* (-1.676)	-0.082 (-0.915)
Number of observations	1097	673	460	1097	1065
Number of countries	77	52	34	77	77
Number of instruments	40	40	40	40	40
AR(2) (P-Value)	0.734	0.520	0.739	0.436	0.630
Hansen (P-Value)	0.349	0.458	0.891	0.306	0.307
Wald (P-Value)	0.001	0.000	0.000	0.402	0.015
Good times: Δln(GDP)> median [Δln(GDP)]$_i$					
Δln(GDP)*F	-0.016 (-0.884)	-0.017 (-1.527)	-0.024** (-2.488)	-0.265*** (-2.965)	-0.147** (-2.193)
Number of observations	566	357	232	566	549
Number of countries	77	52	34	77	77
Number of instruments	40	40	40	40	40
AR(2) (P-Value)	0.460	0.725	0.648	0.709	0.527
Hansen (P-Value)	0.297	0.263	0.731	0.313	0.330
Wald (P-Value)	0.000	0.000	0.002	0.002	0.000
Bad times: Δln(GDP)< median [Δln(GDP)]$_i$					
Δln(GDP)*F	0.002 (0.214)	-0.010 (-0.588)	-0.004 (-0.304)	-0.085 (-1.167)	0.063 (0.874)
Number of observations	480	286	206	480	466
Number of countries	75	49	33	75	75
Number of instruments	40	40	40	40	40
AR(2) (P-Value)	0.240	0.374	0.657	0.195	0.267
Hansen (P-Value)	0.778	0.273	0.854	0.533	0.157
Wald (P-Value)	0.000	0.134	0.019	0.000	0.003

Table 2.4: Estimates of the empirical framework for resource dependence determinants

[32] The Wald test fails to reject the joint non-significance of the interaction specification, but we can at least keep the result for good economic periods.

2.6.4. Sovereign Wealth Funds déterminants

Sovereign wealth funds have developed over the last decades and have been implemented in more and more countries around the world. As such they are becoming an important component in the analysis of fiscal policy reactions especially in resource dependent countries.

As reported in table 2.5, our first result is striking because countries with a sovereign wealth fund have implemented a more countercyclical fiscal policy both through a limitation of expenditure growth in good times and through an expansionary fiscal policy during bad times. While we could have expected the effect of these funds in limiting expenditure growth in good economic periods only, the result for bad economic periods could emphasize the importance of sovereign wealth funds in easing financial constraints for some governments in the sample, either through an improvement of sovereign notation of their external debt or through an availability of wealth as a buffer in case of a major slowdown.

While sovereign wealth funds have been associated with a less procyclical fiscal policy, the next column indicates that this impact may be triggered by older funds[33]. We can give two alternative explanations to this result. On the one hand, more ancient funds may have accumulated better managers, better experience, and better practices managing sovereign wealth than more recent ones. On the other hand, the first implemented sovereign wealth funds in our sample arise from Arab states of the Gulf who managed to reach a decent level of economic development today (Saudi Arabia, Kuwait, United Arab Emirates…).

Then we distinguish three types of sovereign wealth funds depending on their mandates in order to assess their relative effectiveness.

Stabilization funds have been settled in order to save extra resource revenues during good economic periods while feeding the state budget when necessary in case of major slowdowns. Our results fail to evidence a significant impact of these funds on the cyclical behavior of fiscal policy while one of their main objectives is to guard fiscal policy from being influenced by the volatile business cycle of resource dependent countries.

Another type of sovereign wealth funds, namely development sovereign wealth funds include funds whose mandate include long term domestic economic growth, or any specific domestic investment or expenditures mandates. The opinion on such funds is mixed because while some may be willing to safeguard resource wealth from being ratcheted by deciders or political pressure groups, others may wonder why not spending this wealth right away especially in case of huge development needs and high fiscal multipliers. We fail to find any significant effect on the cyclical behavior even though the negative coefficient leans towards a more countercyclical behavior of expenditures.

The third category includes saving funds whose objective is to invest some domestic saved wealth abroad in order to maximize the returns for future generations, for future pensions schemes, or as buffers in case of a sudden economic crisis. In our sample, savings funds have been associated with a more countercyclical behavior of expenditures especially through a limitation of expenditure growth

[33] We used a variable taking the value of 0 if no sovereign wealth funds are operating, and the number of years without discontinuity with at least one operating sovereign wealth fund in the country otherwise.

in good economic periods. Savings funds may have succeeded keeping away some resource wealth from deciders or political pressures so that the government has not overspent in those times.

	SWF	Years since SWF	Stabilization SWF	Development SWF	Savings SWF
Total					
Δln(GDP)*F	-1.606* (-1.770)	-0.020* (-1.846)	0.186 (0.236)	-1.376 (-1.250)	-1.515* (-1.671)
Number of observations	1136	1136	1136	1136	1136
Number of countries	77	77	77	77	77
Number of instruments	40	40	40	38	40
AR(2) (P-Value)	0.814	0.709	0.748	0.592	0.900
Hansen (P-Value)	0.262	0.360	0.373	0.616	0.301
Wald (P-Value)	0.001	0.006	0.009	0.007	0.006
Good times : Δln(GDP)> median [Δln(GDP)]$_i$					
Δln(GDP)*F	-1.510* (-1.670)	-0.033*** (-3.105)	0.492 (1.036)	-0.339 (-0.505)	-1.695** (-2.156)
Number of observations	582	582	582	582	582
Number of countries	77	77	77	77	77
Number of instruments	40	40	40	37	40
AR(2) (P-Value)	0.484	0.549	0.557	0.410	0.495
Hansen (P-Value)	0.165	0.296	0.337	0.813	0.275
Wald (P-Value)	0.001	0.000	0.000	0.001	0.010
Bad times : Δln(GDP)< median [Δln(GDP)]$_i$					
Δln(GDP)*F	-1.992*** (-2.804)	-0.002 (-0.130)	-0.107 (-0.199)	-0.955 (-0.929)	-0.976 (-1.622)
Number of observations	501	501	501	501	501
Number of countries	75	75	75	75	75
Number of instruments	40	40	40	34	40
AR(2) (P-Value)	0.172	0.310	0.332	0.337	0.225
Hansen (P-Value)	0.731	0.521	0.402	0.671	0.396
Wald (P-Value)	0.005	0.021	0.006	0.024	0.009

Table 2.5: Estimates of the empirical framework for SWFs

To the best of our knowledge, the results in this section are the first in the literature evidencing a significant impact of sovereign wealth funds mainly for savings funds, in limiting fiscal procyclicality especially during good economic periods.

Because of the innovative nature of the result we perform additional robustness checks reported in section 2.8.5.

The first robustness checks consist of removing non-commodity related Sovereign Wealth Funds from our fund's variables. In fact, some countries such as Brazil or New Zealand have implemented sovereign wealth funds whose wealth does not originate from natural resource revenues. While this does not modify significantly our other results, savings funds and development funds are now associated with a less procyclical pattern of fiscal policy in bad economic periods.

The second check consists of adding control variables to our main specification. As a result, we introduce the inflation rate, a dummy for an election of the executive power, trade openness, the urbanization rate as well as the dependency ratio, which is a standard set of controls used in the literature. While controlling for these additional effects, our previous results are not altered even though the sovereign wealth funds dummy no more significantly drive fiscal cyclicality on the whole sample and during bad times, while the impact of savings funds is no more significant on the whole

sample. However, the impact of sovereign wealth funds in significantly limiting excessive expenditure growth during good economic periods remains despite the lack of degrees of freedom induced by the additional controls.

Finally, we estimate the same specification but with another measure of expenditures, namely real primary expenditures per capita instead of real total expenditures per capita, so that our fiscal policy variable would be removed from interest debt payments and more accurately catch the discretionary action of the political deciders. The significance of our results is slightly altered even though we still find a significant effect of sovereign wealth funds on the whole sample, and of savings funds during good periods.

2.6.5. Fiscal rules determinants

We benefit from the FAD Dataset 2013 in order to analyze the potential influence of fiscal rules and their various features. We report our results in tables 2.6 and 2.7.

Fiscal rules fail to significantly influence the cyclical behavior of fiscal policy in our data even though some countries may have implemented a fiscal rule as a tool for better fiscal management. Even when we insulate nationally defined or supranationally-defined fiscal rules, none of them seem to significantly trigger the cyclicality of public expenditures. We find a significant effect of more ancient fiscal rules in triggering a more procyclical behavior in good times but the lack of significance for the other variables prevent us from analyzing deeper this result. Assessing the different types of fiscal rules, we do not find any significant influence of either expenditure rules, budget balance rules, or debt rules[34].

[34] Estimates for revenue rules have not been implemented because of the lack of implemented revenue rules in our sample of resource dependent countries.

	FR	National FR	Supra FR	Years since fiscal rule	ER	BBR	DR
Total							
Δln(GDP)*F	1.537 (1.286)	1.570 (1.476)	-0.042 (-0.039)	-0.026 (-0.806)	0.760 (0.494)	0.215 (0.233)	0.932 (0.709)
Number of observations	1136	1136	1136	1136	1136	1136	1136
Number of countries	77	77	77	77	77	77	77
Number of instruments	40	40	33	40	33	40	39
AR(2) (P-Value)	0.312	0.709	0.466	0.669	0.332	0.369	0.324
Hansen (P-Value)	0.699	0.451	0.568	0.719	0.619	0.690	0.566
Wald (P-Value)	0.006	0.028	0.008	0.057	0.002	0.043	0.005
Good times: Δln(GDP)> median [Δln(GDP)]							
Δln(GDP)*F	-0.020 (-0.034)	-0.398 (-0.791)	0.168 (0.254)	0.248*** (3.223)	-0.797 (-0.898)	0.194 (0.350)	0.500 (0.720)
Number of observations	582	582	582	582	582	582	582
Number of countries	77	77	77	77	77	77	77
Number of instruments	39	39	33	40	33	39	36
AR(2) (P-Value)	0.433	0.431	0.373	0.601	0.464	0.381	0.450
Hansen (P-Value)	0.605	0.620	0.415	0.379	0.425	0.753	0.287
Wald (P-Value)	0.001	0.005	0.001	0.000	0.012	0.003	0.001
Bad times: Δln(GDP)< median [Δln(GDP)]							
Δln(GDP)*F	0.203 (0.373)	0.554 (0.999)	-0.855 (-1.033)	0.001 (0.021)	-0.192 (-0.300)	-0.566 (-1.033)	-0.353 (-0.588)
Number of observations	501	501	501	501	501	501	501
Number of countries	75	75	75	75	75	75	75
Number of instruments	39	39	33	39	33	39	39
AR(2) (P-Value)	0.464	0.275	0.401	0.399	0.282	0.322	0.247
Hansen (P-Value)	0.889	0.780	0.336	0.825	0.472	0.694	0.692
Wald (P-Value)	0.004	0.208	0.114	0.000	0.062	0.111	0.015

Table 2.6: Estimates of the empirical framework for fiscal rules

We also find that a fiscal rule associated with a stabilization component such as a structural balance rule accounting for the cycle seem to limit fiscal procyclicality in good periods even though the lack of observations with such a rule (3% of our sample) prevent us from putting more emphasis on this result. Benefiting from the features included in the Fiscal Rules dataset, we fail to find any significant influence of excluding investment expenditures, setting a fiscal responsibility law, implementing an escape clause, using formal enforcement procedures, or defining the rule at the general government level.

In fact, our results tend to reject the significant influence of fiscal rules or any features related to fiscal rules in the cyclical pattern of fiscal policy.

	Stabilization	Investment excluded	FRL	Escape clause	Formal enforcement	General government coverage
Total						
Δln(GDP)*F	-0.825 (-0.885)	-0.685 (-0.831)	0.455 (0.557)	0.300 (0.258)	0.773 (0.748)	0.952 (0.762)
Number of observations	1136	1136	1136	1136	1136	1136
Number of countries	77	77	77	77	77	77
Number of instruments	35	39	39	33	33	36
AR(2) (P-Value)	0.631	0.659	0.400	0.589	0.328	0.298
Hansen (P-Value)	0.881	0.613	0.670	0.515	0.487	0.541
Wald (P-Value)	0.169	0.042	0.059	0.059	0.010	0.017
Good times: Δln(GDP)> median [Δln(GDP)]$_i$						
Δln(GDP)*F	-1.750*** (-3.440)	-0.175 (-0.270)	-0.298 (-0.678)	0.471 (0.906)	0.379 (0.646)	-0.097 (-0.150)
Number of observations	582	582	582	582	582	582
Number of countries	77	77	77	77	77	77
Number of instruments	32	32	35	33	33	36
AR(2) (P-Value)	0.337	0.242	0.375	0.467	0.413	0.345
Hansen (P-Value)	0.799	0.598	0.654	0.220	0.315	0.545
Wald (P-Value)	0.000	0.001	0.003	0.000	0.001	0.001
Bad times: Δln(GDP)< median [Δln(GDP)]$_i$						
Δln(GDP)*F	-0.608 (-0.534)	-0.527 (-1.048)	0.470 (0.901)	-0.426 (-0.565)	-0.301 (-0.549)	-0.188 (-0.214)
Number of observations	501	501	501	501	501	501
Number of countries	75	75	75	75	75	75
Number of instruments	34	38	39	33	33	34
AR(2) (P-Value)	0.356	0.494	0.292	0.180	0.352	0.382
Hansen (P-Value)	0.774	0.589	0.777	0.216	0.393	0.506
Wald (P-Value)	0.015	0.006	0.032	0.013	0.011	0.037

Table 2.7: Estimates of the empirical framework for fiscal rules features

2.6.6. IMF lending arrangements determinants

Our last category of variables includes determinants associated with official IMF lending arrangements whose results are reported in table 2.8. The idea was to assess whether a country who signed an official arrangement with the fund has been forced to implement a more countercyclical policy. These variables were aimed at catching some de jure or de facto conditionality behind these arrangements. While the IMF has been criticized to some extent for promoting structural adjustment programs who sometimes included expenditure cuts, this triggered our will to check whether this impact significantly influenced the fiscal cyclical path.

While we could have expected a significant fall of expenditures during economic slowdowns, the coefficients associated with our variables fail to be significant during bad economic periods. The only significant effect arises from stand-by arrangement (SBA) which seems associated with a reduction of expenditure growth during good periods, but we must take this result with caution due to the weak statistical significance of this result and the lack of complementary results leading into the same direction.

	SBA	EFF	ECF	IMF lending arrangement
Total				
Δln(GDP)*F	-1.060 (-0.635)	0.993 (0.291)	-0.872 (-1.035)	-0.530 (-0.653)
Number of observations	1136	1136	1136	1136
Number of countries	77	77	77	77
Number of instruments	40	40	40	40
AR(2) (P-Value)	0.499	0.307	0.644	0.536
Hansen (P-Value)	0.586	0.847	0.330	0.343
Wald (P-Value)	0.022	0.004	0.006	0.034
Good times: Δln(GDP)> median [Δln(GDP)]$_i$				
Δln(GDP)*F	-3.023* (-1.780)	9.361 (0.958)	0.395 (0.442)	-0.963 (-1.233)
Number of observations	582	582	582	582
Number of countries	77	77	77	77
Number of instruments	40	40	40	40
AR(2) (P-Value)	0.427	0.390	0.847	0.488
Hansen (P-Value)	0.597	0.534	0.386	0.330
Wald (P-Value)	0.001	0.002	0.004	0.068
Bad times: Δln(GDP)< median [Δln(GDP)]$_i$				
Δln(GDP)*F	1.092 (0.853)	0.200 (0.083)	-0.267 (-0.353)	0.414 (0.474)
Number of observations	501	501	501	501
Number of countries	75	75	75	75
Number of instruments	40	39	40	40
AR(2) (P-Value)	0.160	0.227	0.310	0.274
Hansen (P-Value)	0.136	0.306	0.219	0.187
Wald (P-Value)	0.016	0.032	0.151	0.051

Table 2.8: Estimates of the empirical framework for IMF lending arrangements

2.7. Conclusion

While resource dependent countries are particularly sensitive to macroeconomic volatility, the importance of implementing sound economic policies all along the business cycle has been recognized. One way to assess this soundness is to gauge the cyclical behavior of fiscal policy, a countercyclical policy being the preferred path.

In our empirical study we have attempted to fill the lack of studies in the literature analyzing potential determinants of the cyclicality of fiscal policy through the cyclical response of public expenditures to business cycle variations in the context of resource dependent countries. Besides, we have taken the opportunity of this study to gather information regarding sovereign wealth funds which are often overlooked in fiscal policy analysis regarding resource dependent countries despite their rising importance.

Thanks to a common GMM framework estimated on a sample of 81 countries for the period 1992-2012, we have assessed the relevance of alternative candidates in driving the cyclical behavior of fiscal policy as summarized in table 2.9. In accordance with the literature, our study has emphasized the importance of political-economy determinants in limiting a procyclical fiscal policy, especially in the higher part of the business cycle. One of the main contributions of this paper is the empirical evidence of the impact of sovereign wealth funds especially savings funds in limiting the procyclical behavior through a limitation of expenditure growth during good economic periods when fiscal revenues are expected to increase. To the best of our knowledge, this paper is the first empirically

evidencing such a result on an exhaustive sample of resource dependent countries. However, we failed to provide significant evidence of the importance of state financial constraints arguments, fiscal rules, and IMF lending arrangements, in explaining the cyclical path of fiscal policy in resource dependent countries. However, due to the nature of our sample and the limitations associated to the econometric framework, we should not take these results as granted but as a step-in fiscal cyclicality studies which needs to be complemented and confronted by other ones.

While promising our empirical work calls for further analyses on the cyclical behavior of fiscal policy especially in resource dependent countries to complement the present paper. Finally, this study stressed the importance of better referencing the evolving global historical landscape of sovereign wealth funds which motivated the writing of chapter 4.

Family of arguments	Argument	Total	Good times	Bad times
Political-economic arguments	Polity fragmentation	o	+	o
	Democracy	o	-	o
	Executive constraints	o	o	o
	State Fragility	o	o	o
	Absence of political rights	+	o	o
	Absence of civil rights	+	o	o
	Good governance	-	o	-
	Years since arrival of the executive	-	-	o
Financing constraints	Reserves	o	o	o
	Private capital flows/cap.	o	o	o
	(External debt /cap.)$_{-1}$	o	o	o
	Openness of capital account	-	-	o
	Fixed exchange rate	o	o	o
	Financial development	o	o	o
	(Net Official Development Assistance/cap.)$_{-1}$	o	o	o
Resource dependence	Commodity exports (% GDP)	o	o	o
	Commodity revenue (% total revenue)	-	o	o
	Hydrocarbon revenue (% total revenue)	o	-	o
	vol(Country Specific Commodity Price Index)	(-)	-	o
	vol(Country Specific Commodity Price Index)$_{-1}$	o	-	o
Sovereign Wealth Funds (SWF)	SWF	-	-	-
	Years since implementation of the SWF	-	-	o
	Stabilization SWF	o	o	o
	Development SWF	o	o	o
	Savings SWF	-	-	o
Fiscal rules (FR)	FR	o	o	o
	National FR	o	o	o
	Supranational FR	o	o	o
	Years since implementation of the FR	o	+	o
	Expenditure Rule	o	o	o
	Budget Balance Rule	o	o	o
	Debt Rule	o	o	o
Features of fiscal rules	FR+Stabilization (cycl. Adjusted BB or struct. BB)	o	-	o
	FR+Investment excluded	o	o	o
	FR+Fiscal Responsibility Law	o	o	o
	FR+Escape Clause	o	o	o
	FR+Formal Enforcement	o	o	o
	FR+Coverage at the gen. gov. level	o	o	o
IMF lending arrangements	Stand-By Arrangement	o	-	o
	Extended Fund Facility	o	o	o
	Extended Credit Facility	o	o	o
	IMF lending arrangement	o	o	o

o : Non significance of the interaction term → No significant influence on the fiscal procyclical behavior
+ : Interaction term significantly positive → Increase (decrease) significantly the fiscal procyclical (countercyclical) behavior
- : Interaction term significantly negative → Decrease (increase) significantly the fiscal procyclical (countercyclical) behavior
( ) : Joint significance rejected by the Wald test

Table 2.9: Summarize of our empirical results

2.8. Appendices

2.8.1. List of countries in the sample

LIC	LMIC	UMIC	HIC
Benin[af]	Armenia[m]	Algeria[e]	Australia[m]
Burkina Faso[a]	Bhutan	Angola[e]	Bahrain[me]
Burundi[fm]	Bolivia[e]	Argentina[f]	Brunei[e]
Central Afr. Rep.[am]	Cameroon[e]	Azerbaijan[e]	Equatorial Guinea[e]
Chad[e]	Congo[e]	Botswana[m]	Iceland[f]
Dem. Rep. of Congo[me]	Cote d'Ivoire[fe]	Brazil[f]	Kuwait[e]
Ethiopia[f]	Ghana[f]	Chile[m]	New Zealand[f]
Guinea[m]	Guatemala[f]	Colombia[e]	Norway[e]
Guinea-Bissau[f]	Guyana[fm]	Ecuador[fe]	Oman[e]
Kenya[f]	Indonesia[e]	Gabon[e]	Qatar[e]
Kyrgyzstan	*Iraq*[e]	Iran[e]	Saudi Arabia[e]
Malawi[f]	*Mongolia*[m]	Kazakhstan[e]	Trinidad and Tobago[e]
Mali[am]	Nigeria[e]	Libya[e]	United Arab Emirates[e]
Mauritania[fm]	Papua New Guinea[me]	Mexico[e]	
Mozambique[m]	Senegal[f]	Namibia[fm]	
Myanmar[e]	Solomon Islands[a]	Peru[m]	
Niger[m]	Sudan[e]	Russia[e]	
Sierra Leone[m]	Swaziland[f]	Suriname[m]	
Tajikistan[m]	Syria[e]	Turkmenistan[e]	
Tanzania[f]	*Timor-Leste*[e]	Uruguay[f]	
Togo	Uzbekistan[a]	Venezuela[e]	
Uganda[f]	Vietnam[e]		
Zimbabwe[fm]	Yemen[e]		
	Zambia[m]		

[a]: Country dependent on raw agricultural materials (exports>20% G&S exports)
[f]: Country dependent on food (exports >20% G&S exports)
[m]: Country dependent on mining (exports >20% G&S exports)
[e]: Country dependent on energy (exports >20% G&S exports or hydrocarbons revenue>20% total revenue)
in italic: Countries included in the stylized facts but excluded from the GMM estimates due to missing data in terms of trade

Table B.10: List of countries in the sample

2.8.2. List of Sovereign Wealth Funds

Country	Fund	Operation years	Commodity	Type of fund		
				Stabilization	Development	Saving
Algeria	**Revenue Regulation Fund**	2000-	hydrocarbons	X		
Angola	**Fundo Soberano de Angola**	2012-	oil		X	X
Australia	**Western Australian Future Fund**	2012-	minerals			X
	Australian Government Future Fund	2006-	Non-Commodity			X
Azerbaijan	**State Oil Fund of the Republic of Azerbaijan**	1999-	oil	X	X	X
Bahrain	**Mumtalakat Holding Company**	2006-	oil			X
	Future Generations Reserve Fund	2006-	oil			X
Botswana	**Pula Fund**	1993-	diamonds and minerals			X
Brazil	**Sovereign Fund of Brazil**	2008-	non-Commodity	X	X	X
Brunei	**Brunei Investment Agency**	1983-	oil			X
Chad	Revenue Management Plan	2003-2006	oil		X	X
Chile	**Economic and Social Stabilization Fund**	2007-	copper	X		
	Pension Reserve Fund	2006-	copper			X
	Copper Stabilization Fund	1987-2007	copper	X		
Colombia	Oil Savings and Satabilization Fund	1995-2005	hydrocarbons	X		X
Ecuador	FEIREP	2002-2005	hydrocarbons	X	X	
	CEREPS	2005-2008	oil	X	X	
Equatorial Guinea	**Fund for Future Generations**	2002-	oil			X
Gabon	**Fund for Future Generations/Sovereign Fund of the Gabonese Republic**	1998-	oil			X
Ghana	**Ghana Heritage Fund**	2011-	oil			X
	Ghana Stabilization Fund	2011-	oil	X		
Indonesia	**Government Investment Unit**	2006-	non-Commodity	X	X	
Iran	Iran Oil Stabilization Fund	2000-2011	oil	X		
	National Development Fund of Iran	2011-	hydrocarbons		X	X
Iraq	***Development Fund for Iraq***	*2003-*	*oil*		*X*	
Kazakhstan	**National Fund of the Republic of Kazakhstan**	2000-	minerals	X		X
	Samruk-Kazyna JSC	2008-	non-Commodity		X	
	National Investment Corporation	2012-	oil			X
Kuwait	**General Reserve Fund**	1960-	oil	X		
	Reserve Fund for Future Generations	1976-	oil			X
Libya	**Libyan Investment Authority**	2006-	oil			X

In bold: SWFs referenced by the Sovereign Wealth Fund Institute or the International Forum of Sovereign Wealth Funds
In italic: SWFs not taken into account in GMM estimates due to missing data

Table B.11: List of Sovereign Wealth Funds

Country	Fund	Operation years	Commodity	Type of fund		
				Stabilization	Development	Saving
Mauritania	**Mauritania National Fund for Hydrocarbon Reserves**	2006-	hydrocarbons	X		X
Mexico	**Oil Revenues Stabilization Fund of Mexico**	2000-	oil	X		
Mongolia	***Fiscal Stability Fund***	*2011-*	*mining*	*X*		
New Zealand	**New Zealand Superannuation Fund**	2003-	non-Commodity			X
Nigeria	**Nigerian Sovereign Investment Authority (Future Generation Fund, Nigerian Infrastructure Fund, Stabilization Fund)**	2011-	oil	X	X	X
	Excess Crude Account	2004-2011	oil	X	X	
	Petroleum Trust Fund	1995-2004	oil		X	
Norway	**Petroleum Fund of Norway/Government Pension Fund Global**	1990-	hydrocarbons	X		X
Oman	**State General Reserve Fund**	1980-	oil and gas	X		X
	Oman Investment Fund	2006-	oil			X
Papua New Guinea	**Sovereign Wealth Fund (SWF Development Fund, SWF Futures Fund, SWF Stabilization Fund, SWF Management Fund, and others)**	2011-	minerals	X	X	X
	Mineral Resources Stabilization Fund	1974-1999	minerals	X		
Peru	**Peru Fiscal Stabilization Fund**	1999-	minerals	X		
Qatar	**Qatar Investment Authority**	2005-	hydrocarbons			X
Russia	Oil Stabilization Fund of the Russian Federation	2004-2008	hydrocarbons	X		
	Reserve Fund	2008-	hydrocarbons	X		
	National Welfare Fund	2008-	hydrocarbons			X
	Russia Direct Investment Fund	2011-	non-Commodity		X	
Saudi Arabia	**Saudi Arabian Monetary Agency (Foreign Holdings)**	1952-	oil			X
	Public Investment Fund	2008-	oil		X	
Sudan	Oil Revenue Stabilization Account	2002-2011	oil	X		
Timor-Leste	***Timor-Leste Petroleum Fund***	*2005-*	*hydrocarbons*	*X*		*X*
Trinidad-and-Tobago	**Heritage and Stabilization Fund**	2000-	hydrocarbons	X		X
United Arab Emirates	**Abu Dhabi Investment Authority**	1976-	oil			X
	Abu Dhabi Investment Council	2007-	oil			X
	Emirates Investment Authority	2007-	oil			X
	International Petroleum Investment Company	1984-	oil			X
	Investment Corporation of Dubai	2006-	oil			X
	Mubadala Development Company PJSC	2002-	oil		X	
	Ras Al Khaimai Investment Authority	2005-	oil		X	
Venezuela	**Macroeconomic Stabilization Fund**	1998-	hydrocarbons	X		
Vietnam	**State Capital Investment Corporation**	2005-	Non-commodity		X	

In bold: SWFs referenced by the Sovereign Wealth Fund Institute or the International Forum of Sovereign Wealth Funds
In italic: SWFs not taken into account in GMM estimates due to missing data

Table B.11: List of Sovereign Wealth Funds

2.8.3. Data Sources

Category	Variables	Data source
Main variables	Δln(total expenditures/cap.) (gen. gov.)	WEO, WDI
	Δln(GDP)	WEO
	Δln(G&S terms of trade)	WEO
	2009 dummy	-
Political-economy	Polity fragmentation	Polity IV
	Democracy level	Polity IV
	Executive constraints	Polity IV
	State Fragility	Center for Systematic Peace
	Absence of Political Rights	Freedom House
	Absence of Civil Rights	Freedom House
	Good governance	Worldwide Governance Indicator (World Bank)
	Years since executive	Polity IV
Financing constraints	Reserve assets/months of imports	IFS, WEO
	Net private capital flows/(millions of cap.)	WEO, WDI
	$(\text{External debt/cap.})_{-1}$	WEO, WDI
	Openness of capital account	Chinn-Ito Financial Openness Index 2011
	Fixed exchange rate	Ilzetzki et al (2011)
	Financial dev. (liquid liabilities/cap.)	Financial Development Structure Database (World Bank)
	$(\text{Net ODA/cap.})_{-1}$	WDI
Resource dependence	Commodity exports (%GDP)	UNCTAD, COMTRADE, WEO
	Commodity rev. (%total rev.)	WEO, IMF (2012), IMF country reports
	Hydrocarbon rev. (% total rev.)	WEO, IMF (2012), IMF country reports
	Commodity X(%GDP)*vol(CSCPI)	IFS, UNCTAD, COMTRADE, WEO
	Commodity $\text{X(\%GDP)*vol(CSCPI)}_{-1}$	IFS, UNCTAD, COMTRADE, WEO
Sovereign Wealth Funds	Stabilization SWF	SWF Institute, International forum of SWFs, IMF country reports
	Development SWF	SWF Institute, International forum of SWFs, IMF country reports
	Saving SWF	SWF Institute, International forum of SWFs, IMF country reports
	SWF	SWF Institute, International forum of SWFs, IMF country reports
	Years since SWF	SWF Institute, International forum of SWFs, IMF country reports
Fiscal Rules	Fiscal Rule	FAD Fiscal Rules Dataset 2013
	National Fiscal Rule	FAD Fiscal Rules Dataset 2013
	Supranational Fiscal Rule	FAD Fiscal Rules Dataset 2013
	Years since Fiscal Rule	FAD Fiscal Rules Dataset 2013
	Expenditure Rule	FAD Fiscal Rules Dataset 2013
	Budget Balance Rule	FAD Fiscal Rules Dataset 2013
	Debt Rule	FAD Fiscal Rules Dataset 2013
Features of Fiscal Rules	FR + Stabilization	FAD Fiscal Rules Dataset 2013
	FR + Investment excluded	FAD Fiscal Rules Dataset 2013
	FR + Fiscal Responsibility Law	FAD Fiscal Rules Dataset 2013
	FR + Escape clause	FAD Fiscal Rules Dataset 2013
	FR + Formal enforcement	FAD Fiscal Rules Dataset 2013
	FR + Coverage at the gen. gov. level	FAD Fiscal Rules Dataset 2013
IMF programs	Stand-by arrangement	IMF website
	Extended fund facility	IMF website
	Extended credit facility	IMF website
	IMF lending arrangement	IMF website

Table B.12: Data sources

2.8.4. Descriptive Statistics

Category	Variables	Obs	Mean	Std. Dev.	Min	Max
Main variables	∆ln(total expenditures/cap.)	1288	0.030	0.142	-0.784	0.886
	∆ln(GDP)	1288	0.047	0.066	-0.970	0.916
	∆ln(G&S terms of trade)	1288	0.019	0.142	-0.883	0.616
	2009 dummy	1288	0.060	0.237	0	1
Political-economy	Polity fragmentation	954	0.152	0.595	0	3
	Democracy level	1246	0.982	6.469	-10	10
	Executive constraints	1210	4.013	1.994	1	7
	State Fragility	1155	11.896	5.788	0	24
	Absence of Political Rights	1274	4.352	2.024	1	7
	Absence of Civil Rights	1274	4.174	1.688	1	7
	Good governance	1091	-0.367	0.911	-1.980	2.450
	Years since executive	1282	9.859	9.659	1	43
Financing constraints	Reserve assets/month of imports	1176	6.130	6.735	0.002	80.789
	Net private capital flows/(millions of cap.)	1024	-69.867	1643.450	-19900	11962.914
	$(\text{External debt/cap.})_{-1}$	1210	6.237	1.831	0.720	12.364
	Openness of capital account	1185	-0.105	1.519	-1.864	2.439
	Fixed exchange rate	999	0.461	0.499	0	1
	Financial dev. (liquid liabilities/cap.)	1141	-7.527	2.152	-18.364	-2.954
	$(\text{Net ODA/cap.})_{-1}$	1288	48.970	70.292	0	646.770
Resource dependence	Commodity exports (%GDP)	1217	67.828	18.540	6.856	100
	Commodity rev. (%total rev.)	761	40.969	27.873	0	100
	Hydrocarbon rev. (% total rev.)	521	49.558	26.247	0	100
	Commodity X(%GDP)*vol(CSCPI)	1217	1.338	1.410	0.023	10.208
	$\text{Commodity X(\%GDP)*vol(CSCPI)}_{-1}$	1185	1.333	1.423	0.014	10.208
Sovereign Wealth Funds	SWF	1288	0.311	0.463	0	1
	Development SWF	1288	0.064	0.246	0	1
	Saving SWF	1288	0.209	0.407	0	1
	Stabilization SWF	1288	0.196	0.397	0	1
	Years since SWF	1288	4.142	9.907	0	61
Fiscal Rules	Fiscal Rule	1288	0.283	0.450	0	1
	National Fiscal Rule	1288	0.153	0.360	0	1
	Supranational Fiscal Rule	1288	0.130	0.336	0	1
	Years since Fiscal Rule	1288	2.571	5.930	0	46
	Expenditure Rule	1288	0.056	0.230	0	1
	Budget Balance Rule	1288	0.224	0.417	0	1
	Debt Rule	1288	0.204	0.403	0	1
Features of Fiscal Rules	FR + Stabilization	1288	0.032	0.176	0	1
	FR + Investment excluded	1288	0.087	0.282	0	1
	FR + Fiscal Responsibility Law	1288	0.086	0.281	0	1
	FR + Escape Clause	1288	0.105	0.306	0	1
	FR + Formal Enforcement	1288	0.168	0.374	0	1
	FR + Coverage at the gen. gov. level	1288	0.232	0.422	0	1
IMF programs	Stand-by arrangement	1288	0.075	0.264	0	1
	Extended fund facility	1288	0.026	0.160	0	1
	Extended credit facility	1288	0.275	0.447	0	1
	IMF lending arrangement	1288	0.383	0.486	0	1

Table B.13: Descriptive statistics

2.8.5. Robustness checks for Sovereign Wealth Funds determinants

Robustness check 1: Removing non-commodity related Sovereign Wealth Funds

	SWF	Years since SWF	Stabilization SWF	Development SWF	Saving SWF
Total					
Δln(GDP)*F	-1.621* (-1.954)	-0.020* (-1.844)	0.289 (0.372)	-1.221 (-0.935)	-1.623* (-1.746)
Number of observations	1136	1136	1136	1136	1136
Number of countries	77	77	77	77	77
Number of instruments	40	40	40	38	40
AR(2) (P-Value)	0.804	0.698	0.755	0.631	0.930
Hansen (P-Value)	0.238	0.320	0.421	0.801	0.433
Wald (P-Value)	0.001	0.004	0.005	0.023	0.008
Good times : Δln(GDP)> median [Δln(GDP)]$_i$					
Δln(GDP)*F	-1.641* (-1.728)	-0.032*** (-3.175)	0.417 (0.957)	-0.305 (-0.446)	-1.751** (-2.279)
Number of observations	582	582	582	582	582
Number of countries	77	77	77	77	77
Number of instruments	40	40	40	37	40
AR(2) (P-Value)	0.474	0.550	0.549	0.474	0.494
Hansen (P-Value)	0.173	0.271	0.339	0.824	0.312
Wald (P-Value)	0.001	0.000	0.000	0.001	0.005
Bad times : Δln(GDP)< median [Δln(GDP)]$_i$					
Δln(GDP)*F	-1.933*** (-2.961)	-0.002 (-0.116)	-0.411 (-0.743)	-1.644* (-1.832)	-0.995* (-1.710)
Number of observations	501	501	501	501	501
Number of countries	75	75	75	75	75
Number of instruments	40	40	40	34	40
AR(2) (P-Value)	0.167	0.304	0.301	0.343	0.229
Hansen (P-Value)	0.771	0.563	0.450	0.727	0.451
Wald (P-Value)	0.002	0.044	0.010	0.013	0.008

Table B.14: Robustness check 1 - Removing non-commodity related Sovereign Wealth Funds

Robustness checks 2: Introducing additional control variables

	SWF	Years since SWF	Stabilization SWF	Development SWF	Saving SWF
Total					
Δln(GDP)*F	-1.289 (-1.328)	-0.021** (-2.088)	0.151 (0.212)	-1.572 (-1.351)	-1.651 (-1.514)
Number of observations	1135	1135	1135	1135	1135
Number of countries	77	77	77	77	77
Number of instruments	45	45	45	43	45
AR(2) (P-Value)	0.816	0.664	0.718	0.647	0.911
Hansen (P-Value)	0.233	0.335	0.222	0.598	0.339
Wald (P-Value)	0.000	0.002	0.007	0.001	0.001
Good times : Δln(GDP)> median [Δln(GDP)]$_i$					
Δln(GDP)*F	-1.229** (-2.478)	-0.032*** (-2.626)	0.649 (1.157)	-0.080 (-0.095)	-1.380*** (-2.870)
Number of observations	582	582	582	582	582
Number of countries	77	77	77	77	77
Number of instruments	45	45	45	42	45
AR(2) (P-Value)	0.489	0.549	0.612	0.396	0.512
Hansen (P-Value)	0.152	0.307	0.126	0.622	0.503
Wald (P-Value)	0.000	0.011	0.003	0.003	0.003
Bad times : Δln(GDP)< median [Δln(GDP)]$_i$					
Δln(GDP)*F	-0.904 (-1.459)	0.006 (0.312)	0.070 (0.133)	-0.713 (-0.673)	-0.426 (-0.539)
Number of observations	500	500	500	500	500
Number of countries	75	75	75	75	75
Number of instruments	45	45	45	39	45
AR(2) (P-Value)	0.446	0.682	0.633	0.610	0.638
Hansen (P-Value)	0.799	0.718	0.390	0.702	0.504
Wald (P-Value)	0.290	0.204	0.346	0.298	0.054

Table B.15: Robustness check 2 - Introducing additional control variables

Robustness checks 3: Using primary expenditures per capita

	SWF	Years since SWF	Stabilization SWF	Development SWF	Saving SWF
Total					
Δln(GDP)*F	-1.640* (-1.729)	-0.090*** (-4.067)	0.435 (0.489)	-1.615 (-1.342)	-1.490 (-1.582)
Number of observations	1022	1022	1022	1022	1022
Number of countries	72	72	72	72	72
Number of instruments	40	40	40	38	40
AR(2) (P-Value)	0.823	0.698	0.741	0.689	0.687
Hansen (P-Value)	0.403	0.355	0.572	0.779	0.436
Wald (P-Value)	0.001	0.000	0.000	0.003	0.002
Good times : Δln(GDP)> median [Δln(GDP)]$_i$					
Δln(GDP)*F	-1.203 (-1.604)	-0.038 (-1.432)	0.639 (1.123)	0.078 (0.090)	-1.414* (-1.907)
Number of observations	535	535	535	535	535
Number of countries	72	72	72	72	72
Number of instruments	40	40	40	37	40
AR(2) (P-Value)	0.910	0.659	0.524	0.657	0.748
Hansen (P-Value)	0.342	0.316	0.308	0.931	0.506
Wald (P-Value)	0.000	0.000	0.002	0.009	0.003
Bad times : Δln(GDP)< median [Δln(GDP)]$_i$					
Δln(GDP)*F	-1.349 (-1.526)	-0.007 (-0.132)	0.291 (0.312)	-1.606 (-1.611)	-0.684 (-1.160)
Number of observations	441	441	441	441	441
Number of countries	70	70	70	70	70
Number of instruments	40	40	39	34	40
AR(2) (P-Value)	0.653	0.620	0.608	0.649	0.672
Hansen (P-Value)	0.926	0.962	0.790	0.930	0.703
Wald (P-Value)	0.006	0.000	0.024	0.015	0.000

Table B.16: Robustness check 3 - Using primary expenditures per capita

3. Are commodity Price Booms an Opportunity to Diversify? Evidence from Resource dependent Countries

3.1. Introduction

Since the recent commodity price drop, numerous resource dependent countries have faced a situation in which their resource sector has not been able to sustain their economy as a source of resource revenues or foreign exchange reserves. As a result, some of them may have missed the opportunity to diversify their economic structure during the preceding commodity price boom.

While a growing number of these countries accumulated sizable reserves during the preceding commodity price boom, it triggers the question of the relevance of such policies when the domestic financing needs are important, and the domestic return of capital investment exceeds the return on international financial markets. While not contemporaneously related to a more diversified economy, investments in infrastructure, energy provision, and human capital can be the foundations for a more diversified economy producing products of higher quality in the longer run.

According to the resource curse literature[35] export diversification is a desirable feature because macroeconomic volatility could be a main explanation of the resource curse (Van der Ploeg and Poelhekke, 2009). Moreover, exports diversification can promote job opportunities for countries heavily dependent on some capital-intensive commodities such as hydrocarbons and limit social unrest. Popularized by the Netherlands experience in managing natural gas wealth in the 1960s, the Dutch disease phenomenon formalized by Corden and Neary (1982) can also become an undesirable pattern. A commodity windfall can provide factor reallocation toward the resource sector (resource allocation channel) and provide increased sources of spending which could trigger exchange rate overvaluation, a loss of price competitiveness and a decrease in the size of the non-resource tradable sector (spending channel). This pattern can be especially detrimental if it crowds-out the manufacturing sector[36] who is a provider of positive externalities to the rest of the economy.

As a result, diversification is often seen as a policy objective for an economy and to a better extent for an economy heavily reliant on exhaustible commodities such as minerals or hydrocarbons. While it is unclear according to trade theories whether export diversification is optimal or not (Cadot et al, 2013), it can be a desirable recommendation for countries over-reliant on commodity price fluctuations. Nevertheless, it should be stressed that among resource dependent countries, some countries like Botswana (Pegg, 2010) managed to maintain a resource-based economy with good economic outcomes even though it is still unclear whether such experiences could be replicated elsewhere.

Not all diversification patterns may be alike so that the type of activities in which a country specializes can be important. As a result, specializing in goods of higher quality or produced by more developed economies could be more conducive to economic growth (Hausmann et al, 2007). One can see in a network view the production scope as a production tree with more sophisticated products localized in clusters of activities. Initially specializing in core activities provides further

[35] Frankel (2010) and Van der Ploeg (2011) provide extensive surveys of the literature surrounding the resource curse.

[36] The decreasing size of the manufacturing sector can also be associated with an increased productivity in the manufacturing sector moving less productive workers away from the sector (Kuralbayeva and Stefanski, 2013).

diversification potential in related activities while initial endowment in peripheral products like minerals provide limited potential for economic diversification.

Following the study of Imbs and Wacziarg (2003), a great part of the literature on diversification focused on the pattern of diversification along the development path. This pioneer work evidenced a U-shape pattern with countries diversifying their economy at earlier stages of development before re-specializing. While this result has been confirmed for export diversification (Cadot et al, 2011), some recent papers cast some doubt on this non-linear relationship and find a positive linear trend of export diversification along the development path (Parteka and Tamberini 2013, Mau 2016). Beyond the level of economic development, Agosin et al (2012), provide one of the first empirical studies on panel data assessing various determinants[37]. Various studies have followed focusing on different channels impacting export diversification.

Trade facilitation agreements seem conducive to more export diversification (Beverelli et al, 2015) even though different types of trade agreements can have diverging effects (Persson and Wilhelmsson, 2016). Nicita and Rollo (2015) also find that both direct and indirect improvements in market access conditions have increased export diversification among Sub Saharan African countries. Financial development can increase the likelihood of a firm to export to a larger number of countries especially for financially dependent sectors (Chan and Manova, 2015). Makhlouf et al (2015) suggest that trade openness leads to export specialization in autocracies and export diversification in democracies. Domestic institutional reforms can also impact the diversification pattern as evidenced by Sheng and Yang (2016) for China, who show that FDI ownership liberalization, improvement in contract enforcement and a reduction of offshoring costs have been associated with an increase in exports variety. While FDI flows can improve export diversification, the origin of the flow may also matter, with South-South FDI flows increasing export diversification and quality upgrading more than North-South flows (Amighini and Sanfilippo, 2014). Wiig and Kolstad (2012) provide a political economy explanation of diverging diversification experiences, emphasizing the importance of rent-seeking behavior of the ruling elites in impeding diversification in resource-rich countries if it decreases their own interests in the economy. Finally, Habiyaremyie (2016) pointed out that "Angola-mode-deals" between Chinese companies and African governments has improved export diversification thanks to a reduction in the infrastructure bottlenecks negotiated against the access to natural resources.

When analyzing the diversification of an economy, we face the challenge of identifying the relevant indicator. We can identify 3 main indices of export diversification in the literature with their own benefits and challenges (Theil index, Herfindahl index, Gini index)[38]. One advantage of the Theil index is the possibility to disentangle between the intensive margin component (rebalancing of existing product lines) and the extensive margin component (creation of new product lines). Measures of diversification also differ depending on what they measure, some indices focusing on export partners' diversification, export diversification, or output diversification. Closely related measures also include the pattern of structural transformation[39] (value-added importance of the primary or

[37] They find some importance of geographic remoteness, lower trade openness, lower RER volatility, and human capital accumulation in increasing export diversification.

[38] See Cadot et al (2013) for an extensive discussion of their pros and cons.

[39] Structural transformation often defined as the dynamic reallocation of resources from less productive to more productive sectors will be considered here through the evolution of the value-added share of the manufacturing sector in the economy. McMillan and Rodrik (2014) provide evidence for the impact of structural transformation on economic development through the reallocation of labor from low-productivity activities to higher-productivity activities.

manufacturing sector in the economy) or the quality upgrading of products. While focusing mainly on export diversification measured by each component of the Theil index, we also extend the analysis to quality upgrading and structural transformation.

Another challenge when analyzing the evolving structure of an economy is to disentangle various channels which could affect the outcome with various lags. Among the common determinants of a diversified economy we may think of short-run determinants such as price competitiveness[40], medium-run determinants such as financial development, political and economic institutions, trade policy measures (commercial agreements, trade barriers), long-run determinants such as the stock of human capital or the quality of infrastructures. On top of that, one may think about quasi country-specific determinants which include geographic remoteness[41] or the type of former colony[42]. Analyzing the dynamic impact of commodity price booms on diversification, this analysis will focus mainly on a short-to-medium run perspective.

The literature on diversification often focuses on a heterogeneous sample of countries which includes both resource-rich and resource-poor economies. While resource-poor economies face their own challenges for diversifying and upgrading their production, it seems important to provide some insights for resource dependent countries, which may suffer most from excessive specialization in the resource sector. This paper also provides an opportunity to analyze the impact of commodity price booms not only on the evolution of the manufacturing sector through Dutch disease effects but also on export diversification and quality upgrading.

When analyzing policies for countries relying on their resource sector, we face the problem of identifying the relevant countries. One main criticism of the past resource curse literature has been to rely excessively on resource dependence indices because they are an endogenous driver of resource growth[43]. In our case, we are less worried about this issue because our aim is to select countries whose resource sector is important for the economy. A selection based on resource abundance would be less relevant because it would include under-the ground reserves not already exploited which would give a misleading picture. Resource rent does not seem to be an option because of the lack of comparable index with a large country and commodity coverage[44]. As a result, we select in this analysis countries according to their resource-dependence pattern, so that the resulting sample consists of 78 resource dependent countries over 1970-2012[45].

We first perform a cointegration analysis in order to test the cointegration relationship between diversification improvements and commodity price variations. Then we estimate a Pooled Mean Group (PMG) model which enables both short term and error correction term coefficients to be

[40] While exchange rate undervaluation is seen as a standard driver of both exports growth and diversification, Sekkat (2016) finds no evidence of this channel.
[41] Even geographic remoteness can be an evolving component depending among other things on the existing trade flow networks or the transport costs.
[42] The number of years between the start of oil production and a country political independence seems to be positively related to more diversified exports (Omgba, 2014), so that the type of colony (extractive colonies or settlers' colonies) and its related institutions still impact current economic outcomes.
[43] Authors then relied on indices of resource abundance which is not strictly exogenous and on resource rents whose data are scarce and often concentrated on oil production.
[44] The natural rent index of the World Bank database on wealth distribution would have been an alternative but it takes into account under the ground resources, does not give estimates for some countries, has a limited time-coverage, and does not include mining products such as diamonds which represent a great share of production in economies like Botswana or Central African Republic.
[45] This sample corresponds to the sample presented in section 1.4.3 without the 3 countries whose commodity exports ratio was under 40% over 2003-2007 (Swaziland, Timor-Leste, Mexico).

country-specific while the long-run relationship is restricted to be the same across countries. When analyzing the importance of the resource sector, one may wonder which commodities are relevant to include in the study. Different types of commodities trigger their own challenges. Some papers restrict their analysis to point-source resources (mainly exhaustible minerals, hydrocarbons, and cash crops) which are often easier to control and to extract rents. Exhaustible resources trigger their own challenges regarding intergenerational equity and dynamic resource exploitation and management. Another difference may arise between capital-intensive and labor-intensive commodities[46]. While first considering the resource sector as a whole in our baseline estimates, we will provide some estimations using different commodity classifications.

However, commodity-dependent countries are affected heterogeneously by some global factors (US monetary policy, the oil price variations, global crisis…) which lead to reject the assumption of cross-section independence in the PMG model. As a result, we have carried out our baseline regressions using a Common Correlated Effects Mean Group (CCEMG) model which takes into account cross-section dependence. We also provide some robustness checks in this analysis. We find a significant positive impact of commodity price variations on export concentration through a concentration of already exported products.

While our previous models have analyzed the overall relationship between commodity price variations and diversification developments, we then restrict our analysis to periods of significant commodity price booms and busts. We develop a methodology to identify these relevant episodes and analyze the evolution of the diversification indicators during these time spans. Countries facing a major commodity price boom have significantly concentrated their exports but have diversified during major commodity price busts. While we found evidence of a decrease in the manufacturing sector value added share during commodity price booms, we failed to find any significant evolution during commodity price drops.

Comparing the evolution of our diversification indicators during commodity price boom episodes occurring in the 1970s and in the 2000s we have found a greater concentration of exported products during the 2000s booms than in the 1970s which explains partly the current difficulty of undiversified economies to recover in the new context of low commodity prices.

This paper is organized as follows. We first explain the computation of our data before giving some preliminary relationships between commodity price variations and the diversification pattern in section 3.2. Our empirical strategy is explained in detail in section 3.3 including the cointegration relationship, the common correlated effect model, and the commodity price booms and busts analysis. Section 3.4 thus provides our empirical results before giving some policy lessons in section 3.5.

[46] Van der Ploeg and Rohner (2012) suggest that the likelihood of a conflict increases with a rise in capital-intensive resources (oil, natural gas…) but with a decrease in labor-intensive resources (coffee, rice…)

3.2. Preliminary data

3.2.1. Relevant country coverage

As discussed in section 1.2 we remove 3 countries from our sample of resource dependent countries whose share of commodity exports over total exports is under 40% over 2003-2007 (Mexico, Timor-Leste, Swaziland) but who were selected in the previous because of the relative importance of resource revenues in these countries.

The resulting sample consists of 78 countries over 1970-2012[47]. While the diversification indices used in this paper only cover our sample until 2010, we have used two further years for regressions using the ratio of manufacturing value added in order to get more insights for the last years following the late 2000s commodity price boom.

3.2.2. Country specific commodity price indices

In order to capture country-specific commodity price variations, we compute a Country-Specific Commodity Price Index (*CSCPI*) as a weighted average of commodity prices weighted by the relative importance of each commodity in commodities exports over 2003-2007. The commodity export weights cover 57 commodities including 32 food products, 6 raw agricultural materials, 15 mining products, and 4 fuel products which have been presented in section 1.4.2.

We rely on the pattern of commodity specialization over 2003-2007 in order to capture the real pattern of commodity dependence over 1970-2012. As explained before, we have selected this period because it was the oldest period for which we could get a comprehensive pattern for most of our countries and as a result the most comprehensive data coverage. Another possibility would have been to use an index whose commodity weights would have been time-varying, but it would limit the exogeneity of our index. On top of that, while the ratio of commodity dependence may have evolved over four decades, we may think that the commodity specialization within the commodity sector would not have changed so much. Section 1.4.3 has provided descriptive tables including these country-specific commodity weights for commodities whose weights exceed 5% of the computed basket of exported commodities.

3.2.3. Diversification patterns

As explained by Cadot et al (2013), there are three main indicators of diversification in the literature: The Herfindhal index, the Theil index, and the Gini index. Even though the Herfindhal index has been often used in empirical studies, we have used the Theil index for two main reasons. First, the Theil index can be decomposed in an intensive margin diversification index catching the rebalancing of

[47] Appendix 4 describes the specialization patterns of these countries, while appendix 2 and 3 explain the methodology behind the aggregation of commodity exports, and the matching between trade and price data.

existing product lines, and an extensive margin diversification index taking into account new product lines, thus providing potential further insights for our empirical study. Moreover, we benefit from Theil indices originating from the IMF database[48] on export concentration constructed thanks to the UN-NBER database on trade flows over 1962-2010, which to our knowledge is the database with the largest time and country coverage available on export concentration. A higher value of the concentration indices refers to a less diversified economy and conversely.

As a result, this study will cover 5 indicators of diversification: the composite Theil index of export concentration, the intensive margin index, the extensive margin index, an index for the quality of exported goods, as well as the manufacturing value added share over GDP. While the first three indicators are directly related to export diversification, we use the last two in order to get some insights into the impact of commodity price booms on quality improvement (proxied by the relative quality index of exported goods[49]) and structural transformation (proxied by the manufacturing value added share over GDP).

In order to get some preliminary insights, we present some graphics plotting country-specific Pearson correlation coefficients between the log of our indicators and the log of CSCPI during periods of CSCPI growth[50] against the same country-specific correlation coefficients under periods of CSCPI drops[51].

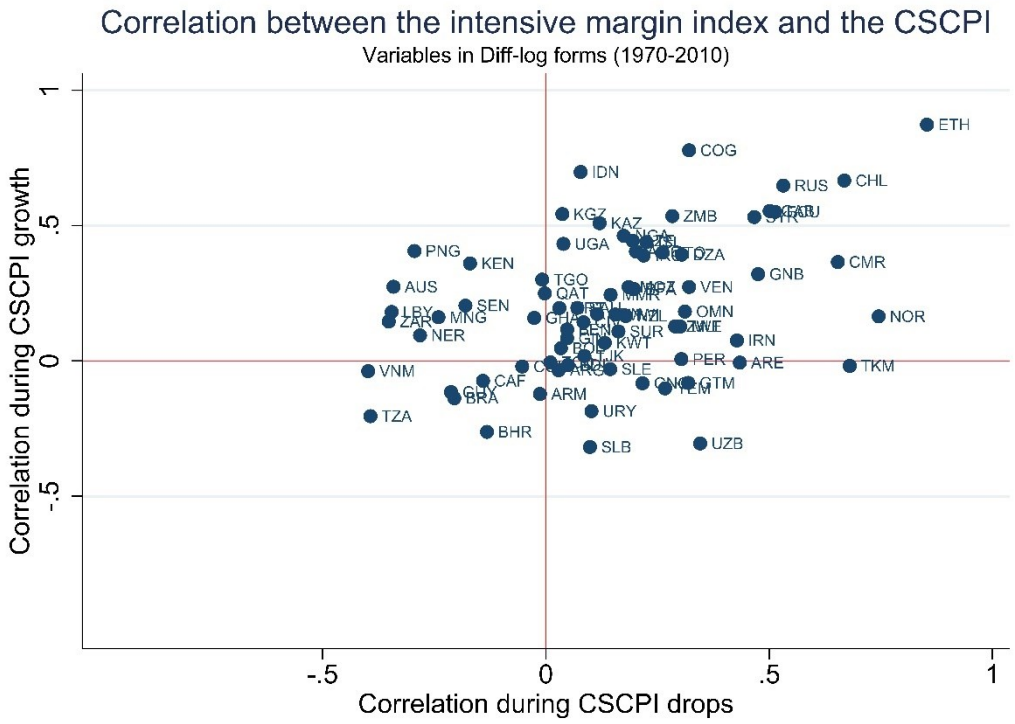
We should remind that our export concentration indices and its extensive and intensive margin components are coded so that a lower value corresponds to a higher level of diversification. In figures 3.1.a, 3.1.b, and 3.1.c, countries in the top-left corner would have concentrated their exports both in periods of commodity price increase and decrease, countries in the bottom-right corner would have diversified their exports in both periods, countries in the bottom-left corner would have diversified their exports during commodity price increases and concentrated their exports during commodity price decreases, while countries in the top-right corner would have diversified their exports during commodity price decreases and concentrated their exports during commodity price increases.

At first sight, a sizable number of countries are situated in the top-right corner which means that those countries have diversified their exports during bad periods and concentrated during good periods even though the pattern is mixed for the extensive margin index.

Regarding figures 3.1.d and 3.1.e, the interpretation should be the reverse so that countries having increased the relative quality or the manufacturing value-added share in both periods are now situated in the top-left corner and countries having decreased the relative quality or the manufacturing value-added share in both periods are in the bottom-right corner. Even though some heterogeneity exists in figure 3.1.d, half of our countries are located in the bottom-left corner for the quality index which means they would have increased the overall relative quality of their exports

[48] See IMF (2014) for further details regarding the data.
[49] This index originates from the same IMF diversification database and has been constructed thanks to adjusted export unit values in relative terms so that the quality of exported goods is expressed relative to the world 90th percentile of quality for each exported good. See Henn et al (2013) for further details.
[50] A positive correlation coefficient during commodity price increases means an increase of the concentration index, that is to say a decrease in diversification, which corresponds to observations at the top of the figure.
[51] A positive correlation coefficient during commodity price drops means a decrease of the concentration index, that is to say an increase in diversification, which corresponds to observations on the right-hand side of the figure.

during commodity price decreases and decreased it during price increases. Figure 3.1.e concerning the manufacturing value-added share depicts no clear pattern and warrants deeper analysis.



<u>Figure 3.1.a</u>: Simple correlation coefficients between the concentration index and the CSCPI during CSCPI growth and drops

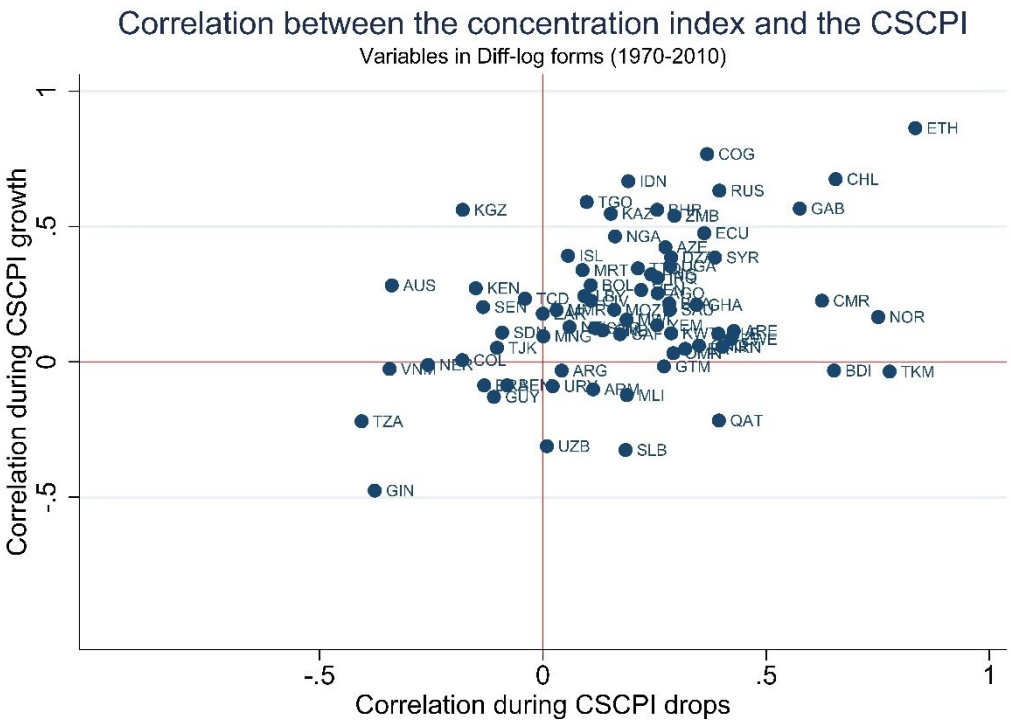


Figure 3.1.b: Simple correlation coefficients between the intensive margin index and the CSCPI during CSCPI growth and drops

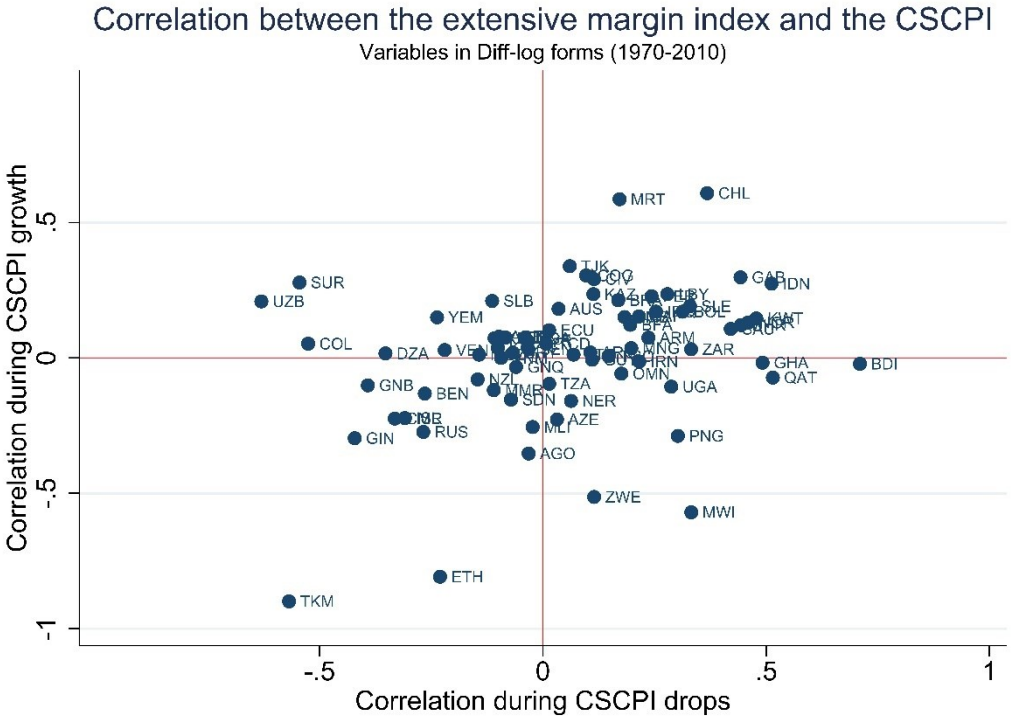


Figure 3.1.c: Simple correlation coefficients between the extensive margin index and the CSCPI during CSCPI growth and drops

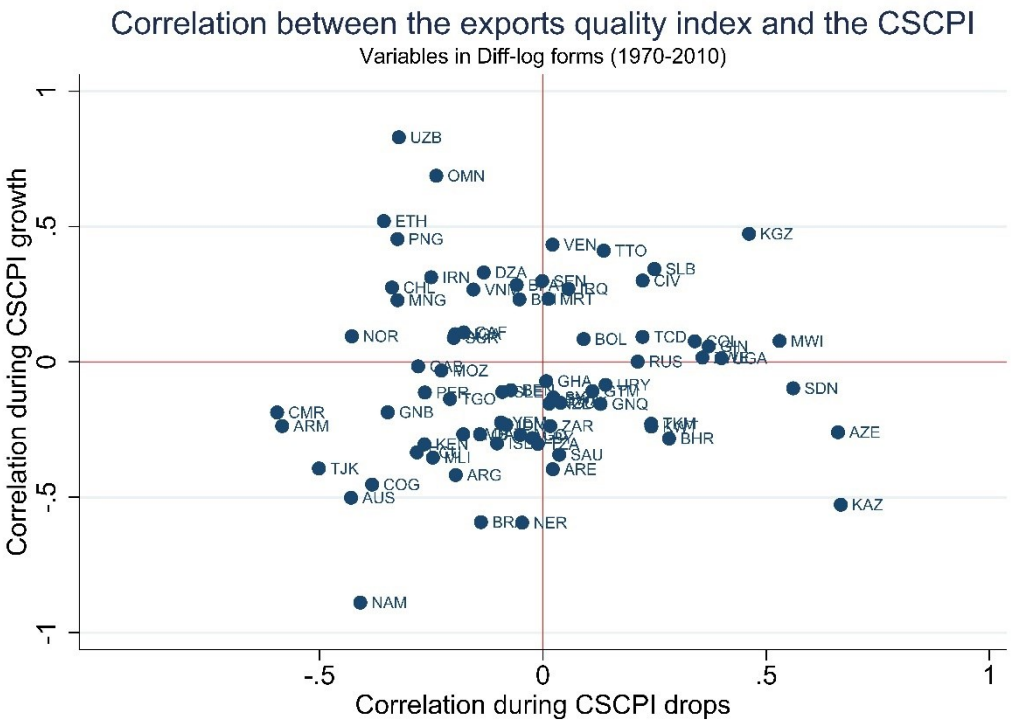


Figure 3.1.d: Simple correlation coefficients between the exports quality index and the CSCPI during CSCPI growth and drops

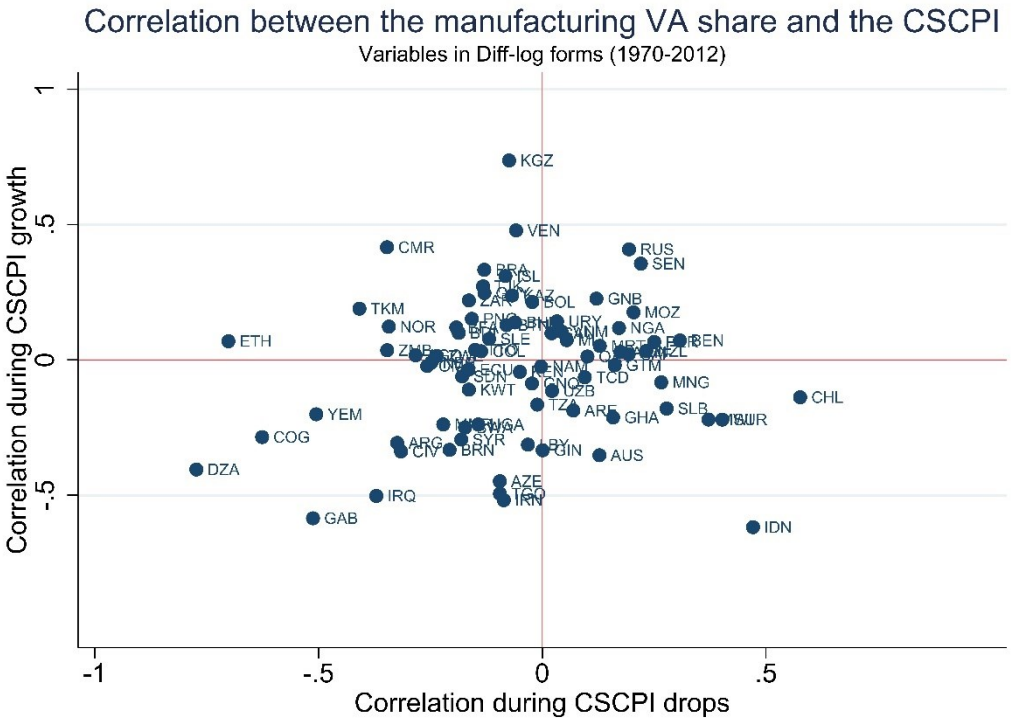


Figure 3.1.e: Simple correlation coefficients between the manufacturing VA share and the CSCPI during CSCPI growth and drops

3.3. Empirical strategy

3.3.1. Cointegration analysis

A first step in the analysis could be to assess the non-stationarity properties of our main variables of interest leaving aside for the moment other control variables. In this section we will only focus on the concentration index (*Conc Index*) because it is our main proxy and we will study its relationship with the growth rates of commodity prices both in the short run and in the long run. We assess these properties with both Maddala and Wu (1999) and Pesaran (2007) tests. This latter improves on other panel unit root tests by taking into account potential cross-section dependence which may arise in our data due to common global shocks and cross-section spillovers. As a result, we will guide our analysis thanks to the Pesaran CIPS test.

Then we will be able to provide cointegration tests thanks to Westerlund (2007) that takes into account short-term country-heterogeneity as well as country-specific speed of adjustment in the cointegration relationship. In order to estimate the cointegration relationship, we will make use of the Pooled-Mean-Group (PMG) estimator developed by Pesaran et al (1999). This estimator improves on the Mean-Group (MG) estimator developed by Pesaran and Smith (1995) in that it restricts the long-run relationship to be homogenous across individuals, while enabling country-specific short-run responses and speeds of adjustment.

$$\Delta \ln\left(Conc\ Index_{i,t}\right) = \emptyset_i\left[\ln\left(Conc\ Index_{i,t-1}\right) - \theta' \ln(CSCPI_{i,t})\right] + \sum_{j=0}^{1} \delta'_{ij} \Delta \ln(CSCPI)_{i,t-j} + \varepsilon_{i,t} \quad (1)$$

Let equation (1) represent our PMG specification with $\emptyset_i$ a vector of country-specific error correction terms expected to be significantly negative, θ' the long-run estimated coefficient, δ'_{ij} a vector of country-specific short-run coefficients to be estimated, and ε_{it} and error term. The homogeneity of the long-run relationship is not straightforward especially with a panel of countries with heterogeneous levels of development and heterogeneous commodity specialization patterns. As a result, we will estimate the MG relationship for each specification and perform a Hausman test of the non-systematic difference between the coefficients of both models. If we fail to reject the non-difference between the estimated parameters, it will validate the choice of the PMG estimator. We have included the contemporaneous commodity price variation as well as its first lag in order to control for potential lags in the relationship.

Even though we could only estimate one PMG model and check the aggregate significance of the speed of adjustment as a check of a cointegration relationship, we perform the Westerlund (2007) test for each specification and report the 4 statistics[52].

Because we are aware of the heterogeneity in commodity specialization, we group countries according to their type of specialization. As a result, a country belongs to one of the 4 groups; food exporters (*food*), raw agricultural materials exporters (*rawagri*), mining products exporters (*mining*), or energy exporters (*energy*), when its exports of commodities belonging to this group has exceeded

[52] Gt and Ga are statistics based on group-mean and test against the alternative hypothesis of at least one cointegration relationship among our countries, while the panel Pt and Pa statistics are built on the alternative hypothesis of a cointegration relationship for the whole panel.

20% of total goods and services exports over 2003-2007[53]. We will provide PMG estimates as well as the associated tests for these 4 groups of countries, as well as a 5th group named as *exhaustible* which gathers countries whose exports of exhaustible commodities (proxied by the sum of mining and energy exports) exceeds 20%. There are numerous reasons for analyzing specifically this category because the commodities belonging to it are often more capital intensive, more point-source and more prone to rent-grabbing, as well as facing the challenge of exhaustibility.

3.3.2. Common correlated effects estimates

Even though the PMG estimator provides an efficiency improvement in comparison with traditional estimators, it fails to account for cross-section dependence which may arise because of common global shocks or spillovers between countries. This problem is all the most striking in our case because of the impact of global shocks on commodity price markets (US monetary policy, oil price variations, global financial crisis…). In order to control for these common factors that both affect our dependent and independent variables, Pesaran (2006) has developed a Common Correlated Effects (CCE) model which is a Mean-Group type of estimator so that it can be defined as a Common Correlated Effects Mean-Group (CCEMG) model.

$$Y_{i,t} = \beta_i X_{i,t} + u_{i,t} \ (2)$$
$$u_{i,t} = \alpha_{1i} + \lambda_i F_t + \varepsilon_{i,t} \ (2)'$$
$$X_{i,t} = \alpha_{2i} + \lambda_i F_t + \gamma_i G_t + e_{i,t} \ (2)''$$

Let equation (2) represent our main equation with $X_{i,t}$ a vector of explanatory variables, β_i a vector of country-specific coefficients, $Y_{i,t}$ our dependent variable, and $u_{i,t}$ containing the unobservable factors. In this model, $u_{i,t}$ can be explained in equation (2)' as a function of unobserved common factors F_t with heterogeneous factor loadings λ_i. Similarly, the vector of explanatory variables $X_{i,t}$ can be described in (2'') as a function of the same unobserved common factors F_t and another set of unobserved common factors G_t with γ_i being the heterogeneous factor loadings related to G_t. Let α_{1i} and α_{2i} represent country-specific constants, and $\varepsilon_{i,t}$ and $e_{i,t}$ are the error terms.

With the same functioning as the Mean-Group estimator, it estimates the relationship for each cross-section and averages the resulting coefficients β_i across individuals. We will use a version of the CCEMG estimator which is robust to potential outliers and gives a weighted average of each coefficients[54]. In order to control for the common global factors that affect the independent and the dependent variables in every country but with different strength as highlighted in equations (2)' and (2)'', the model augments the cross-section regressions with cross-section averages of the dependent and independent variables.

This estimator presents the best trade-off in order to estimate the impact of commodity price variations on our diversification related variables and will use it as our benchmark. The estimations

[53] As such a country can belong to multiple groups such as Central African Republic which is considered both in the mining group and in the raw agricultural material group. Countries can also belong to no group if their commodity exports are split between each group and fall below the threshold (Togo, Kyrgyzstan).

[54] This seems important in our study because while the IMF database has been implemented with great care, we cannot rule out completely the possibility of some swings in our indices related to customs methodology changes, changes of goods classification, a change in the taxation of exports (or imports because some trade figures were built thanks to mirror data).

have been carried out for each of the 5 dependent indicators of export diversification presented previously.

Unlike the previous section, we will introduce some control variables in the model. We will distinguish two types of control variables: permanent control variables which would appear in each specification and potential control variables which are introduced to check the stability of the main specification.

$$\Delta \ln(Div)_{i,t} = \beta_{0,i} + \beta_{1,i}\Delta \ln(CSCPI)_{i,t} + \beta_{2,i}\Delta \ln(REER)_{i,t} + \beta_{3,i} \ln(GFCF\ share)_{i,t} + \beta_{4,i} \ln(School)_{i,t} + \beta_{5,i}C_{i,t} + \varepsilon_{i,t} \quad (3)$$

Let equation (3) refers to our main empirical specification. $\Delta \ln(Div)_{i,t}$ refers to the diff-log form for alternatively each of our 5 dependent variables related to diversification: the concentration index (*Conc Index*), the intensive margin index (*Int margin*), the extensive margin index (*Ext margin*), the relative quality index (*Quality Index*), and the manufacturing value-added share (*Manu share*). Our main interest coefficient $\beta_{1,i}$ is related to commodity price variations proxied by the diff-log form of commodity prices $\Delta \ln(CSCPI)_{i,t}$. In specifications using the diversification indices, a positive value for $\beta_{1,i}$ would mean that commodity price variations evolve in the same direction as export concentration[55], while a negative value for $\beta_{1,i}$ would mean that commodity price variations evolve in the same direction as export diversification.

Our core of permanent control variables consists of Real Effective Exchange Rate Δ*ln(REER)* variations[56], the stock of human capital *ln(School)* proxied by the secondary school enrollment ratio (WDI) [57], as well as the stock of infrastructure *ln(GFCF share)* proxied by the share of gross fixed capital formation in total GDP (UNSTAT)[58]. This specification gives us 2 potential long-run determinants of the diversification pattern which are expressed in log, and two shorter-term determinants which are expressed in diff-log. The inclusion of REER variations is especially important because economists have evidenced for years a relationship between commodity price booms and REER appreciation triggered by increased domestic spending following the commodity price boom, and which progressively increases the price of tradable goods relative to non-tradable goods. Using variations of REER in our specification we control for this Dutch disease related spending channel so that the estimated coefficients on CSCPI variations could be interpreted as a direct effect of commodity price booms on the diversification indicator.

In order to confirm the validity of our results, we introduce one by one alternative control variables $C_{i,t}$. This includes the volatility of commodity prices *vol(CSCPI)*[59], the country labor market size *ln(pop active)* proxied by the stock of active population (WDI), the ratio of goods and services imports over GDP *ln* ($\frac{M}{GDP}$) as a proxy for trade openness[60], the financial development *ln(financial dev)* proxied by

[55] We should keep in mind that a positive coefficient could be either the sign of export concentration during commodity price increases or export diversification during commodity price decreases.
[56] See Section 3.6.1 for an explanation of the REER computation.
[57] Because of gaps in the data we have used the moving average using 4 lags and the contemporaneous data in our specifications in log, while we will refer to the original index for the Δln specifications.
[58] While imperfect, this proxy controls for the importance of capital investments which could be targeted towards energy supply, transport infrastructure, or telecommunication infrastructures, which are crucial to open new business activities.
[59] These series are computed as conditional standard deviations from a GARCH(1,1) model on monthly CSCPI series and averaged by year.
[60] We may expect a will to import a variety of products which could trigger export diversification. It may also catch some evolution of trade policies over time. The results remained apparently the same with the ratio of exports plus imports over GDP, but we feel that the ratio of imports to GDP has more theoretical justifications.

the ratio of liquid liabilities per inhabitants (World Bank Financial Development Structure Database), the Chinn-Ito index of capital openness rescaled to be bound between 0 and 1 *ln(capital open)*[61], the polity 2 index (Polity IV) rescaled to be bound between 0 and 1 *ln(democracy)*[62], and the log level of PPP GDP per capita *ln(PPP GDP pc)*[63] (WEO).

3.3.3. Selection of commodity price episodes

While the estimation of the CCEMG model will give us some great empirical insights into the relationship between commodity price variations and the evolution of the diversification pattern, these estimates have been carried out on every data observation. However, we may think that only periods of strong commodity price increase (defined as boom episodes) or strong commodity price drop (defined as bust episodes) should be relevant to study.

As such, we will provide some insights into the evolution of the diversification related indicators during the commodity price episodes defined previously. This strategy will enable us to catch longer-run impacts of commodity price booms/busts on diversification outcomes especially through the evolution of capital expenditure or human capital. However, it would have been better to compare pre-boom/bust and post-boom/bust periods to gauge their impact on diversification, but we lack data observations before the 1970s boom and after the 2000s boom[64].

Our first task consists in identifying episodes of commodity price booms and busts in order to select periods in which the commodity price variations have impacted the most our selected countries. As a result, we benefit from the Country Specific Commodity Price Indices computed as described previously in order to identify these episodes.

A first methodology could have been to extract a stochastic cyclical component from our CSCPI series thanks to time-series filtering methodologies. However, filtering methodologies have been mostly used for identifying business cycle variations. One major difference between business cycles and commodity price cycles relies in the longer duration of commodity price cycles which complicates the identification of commodity price cycles on our covered period of 41 years[65]. Moreover, filtering

[61] Capital openness can proxy the openness to FDI flows which can bring about new technologies and knowledge necessary in order to process new activities. Moreover, the liberalization of FDI inputs can provide huge efficiency gains for the domestic economy. However, capital openness can enable brutal capital reversals with its domestic destabilizing impacts.

[62] This proxy is far from perfectly catching the quality of institutions, but it is really challenging to get a proxy for the quality of institutions with enough within variations which dates to the 1970s. We have taken the polity2 indicator as a second best because it proxies above all political institutional output. It may control for the different determinants of capital investments and business operation between more democratic regimes and more autocratic regimes.

[63] This latter is a standard determinant of exports diversification in the literature motivated by the early empirical focus on the relationship between the level of economic development and export diversification. However, the level of development is too much correlated with relevant determinants such as the financial development (0.75), capital openness (0.54), or the school enrollment ratio (0.76) which complicates its inclusion among our key control variables, and leads us to include it only as a robustness check.

[64] The identified start of the 1970s commodity price boom has often been set to 1970 because we lack past data for some commodities while the boom may have started earlier.

[65] Burns and Mitchell (1946) defined standard business cycle variations as lasting from 1.5 to 8 years which correspond to commonly adopted parameters in filtering methodologies. However, commodity price cycles

methodologies often perform poorly at both the beginning and the end of the time period, that is to say when we would need the most to identify episodes related to the 1970s and 2000s commodity price booms[66]. Thus, we relied on CSCPI variations directly in order to classify commodity price episodes.

We did not rely on direct growth rates from our CSCPI series because our empirical strategies will use some log or diff-log forms of our CSCPI series. As a result, we will consider hereafter commodity price growth as the difference between consecutive CSCPI observations in log forms.

First, we compute a positive cumulative price shock (*Cumshock*) which is the product of current plus past commodity price increases since the last commodity price drop. Alternatively, a negative cumulative price shock corresponds to the product of current plus past commodity price drops since the last commodity price increase.

Then we select commodity boom episodes when the peak positive cumulative price shock belongs to the top 10% of positive cumulative price shocks. Alternatively, we select commodity price bust episodes when the peak negative cumulative price shock belongs to the top 10% of negative cumulative price shocks[67]. While able to select continuous booms and busts this selection overlook some quick reversal of commodity price variations before a continuation of previous commodity price increase or drop.

To tackle this problem, we test for each year whether our adjusted cumulative commodity price shocks between the beginning and the end of the tested period remain above the selected threshold of cumulative commodity price shocks. We perform these tests for years earlier and beyond the first selected period until the adjusted cumulative commodity price shock fall below the threshold. While this modification catches more relevant episodes it extends our selection of episodes further than necessary, so we restrict the time periods from troughs to peaks or conversely.

The resulting sample presented in tables 3.1 and 3.2 consists of 94 commodity price booms episodes in 56 countries and of 77 commodity price busts episodes in 68 countries.

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often referred as commodity price super-cycles seem to last between 20 and 70 years (Erten and Ocampo, 2013).

[66] Even though only the Baxter and King (1999) filter induces some loss of observation because it relies on moving averages, other filters like the Band-Pass Christiano and Fitzgerald (2013) or the High-Pass Hodrick-Prescott (1997) filters perform poorly at both ends of the sample. We tried both methodologies as well as the Butterworth (1930) methodology each with different parameters but it provided irrelevant commodity price episode selections.

[67] While one could think this threshold would poorly select commodity price episodes, we should remind that 10% of positive (negative) commodity price observations consists approximatively of 5% of our data sample because cumulative price shocks observation only includes positive (negative) commodity price variations. Moreover, some episodes include multiple observations of cumulative commodity price shocks above our threshold which incited us to select a less binding threshold. The threshold values for the cumulative shock are respectively +84.3% and -44.2%.

Country	Cumshock	Beginning	End	Duration	Country	Cumshock	Beginning	End	Duration
Algeria	325.1%	1970	1980	11	Kyrgyzstan	189.0%	1999	2011	13
Algeria	283.5%	1998	2008	11	Libya	328.2%	1970	1980	11
Angola	319.8%	1970	1980	11	Libya	329.3%	1998	2008	11
Angola	325.3%	1998	2008	11	Mali	105.8%	1970	1974	5
Argentina	93.0%	1970	1974	5	Mauritania	225.7%	2002	2010	9
Argentina	108.6%	1999	2008	10	Mongolia	224.6%	2001	2011	11
Australia	165.2%	1999	2011	13	Myanmar	104.0%	1970	1974	5
Azerbaijan	293.7%	1970	1980	11	Niger	89.4%	1970	1974	5
Azerbaijan	293.9%	1998	2008	11	Nigeria	325.6%	1970	1980	11
Bahrain	155.3%	1998	2008	11	Nigeria	323.4%	1998	2008	11
Bhutan	148.0%	2001	2008	8	Norway	270.6%	1970	1980	11
Bolivia	183.6%	1970	1980	11	Norway	241.4%	1998	2008	11
Bolivia	158.9%	1999	2008	10	Oman	320.1%	1970	1980	11
Brazil	98.2%	2002	2008	7	Oman	306.6%	1998	2008	11
Brunei	329.9%	1970	1980	11	Papua New Guinea	102.9%	1971	1974	4
Brunei	289.0%	1998	2008	11	Papua New Guinea	194.7%	2001	2011	11
Burkina Faso	89.8%	2009	2011	3	Peru	95.5%	1971	1974	4
Burundi	199.8%	2001	2011	11	Peru	199.3%	2002	2011	10
Cameroon	106.7%	1970	1974	5	Qatar	330.3%	1970	1980	11
Cameroon	160.6%	1998	2011	14	Qatar	289.0%	1998	2008	11
Chad	272.3%	1970	1980	11	Republic of Congo	272.7%	1970	1980	11
Chad	235.9%	1998	2008	11	Republic of Congo	281.8%	1998	2008	11
Chile	167.1%	2002	2011	10	Russia	248.3%	1970	1980	11
Colombia	228.5%	1970	1980	11	Russia	247.8%	1998	2008	11
Colombia	158.3%	1998	2008	11	Saudi Arabia	325.0%	1970	1980	11
Cote d'Ivoire	108.3%	1971	1974	4	Saudi Arabia	325.7%	1998	2008	11
Cote d'Ivoire	104.9%	1999	2008	10	Senegal	102.9%	1970	1974	5
Ecuador	198.9%	1970	1980	11	Sudan	283.7%	1970	1980	11
Ecuador	178.3%	1998	2008	11	Sudan	270.6%	1998	2008	11
Equatorial Guinea	323.7%	1970	1980	11	Syria	246.8%	1970	1980	11
Equatorial Guinea	324.2%	1998	2008	11	Syria	246.2%	1998	2008	11
Ethiopia	96.8%	2001	2008	8	Togo	101.2%	1970	1974	5
Gabon	250.6%	1970	1980	11	Togo	116.1%	2001	2008	8
Gabon	254.9%	1998	2008	11	Trinidad and Tobago	297.4%	1970	1980	11
Ghana	91.2%	1971	1974	4	Trinidad and Tobago	243.8%	1998	2008	11
Guyana	108.1%	1971	1974	4	Turkmenistan	312.1%	1970	1980	11
Indonesia	103.1%	1972	1974	3	Turkmenistan	205.4%	1998	2008	11
Indonesia	151.7%	1999	2008	10	United Arab Emirates	283.2%	1970	1980	11
Iran	307.5%	1970	1980	11	United Arab Emirates	259.7%	1998	2008	11
Iran	319.0%	1998	2008	11	Uzbekistan	84.3%	2002	2008	7
Iraq	327.9%	1970	1980	11	Venezuela	300.0%	1970	1980	11
Iraq	337.6%	1998	2008	11	Venezuela	306.9%	1998	2008	11
Kazakhstan	220.2%	1970	1980	11	Vietnam	111.7%	1970	1974	5
Kazakhstan	275.8%	1998	2008	11	Vietnam	117.6%	2002	2008	7
Kuwait	316.0%	1970	1980	11	Yemen	313.4%	1970	1980	11
Kuwait	314.3%	1998	2008	11	Yemen	302.1%	1998	2008	11
Kyrgyzstan	113.3%	1970	1974	5	Zambia	193.2%	2002	2011	10

Cumshock: Refers to the cumulative price growth from the beginning to the end of each episode

Table 3.1: Commodity price boom episodes

Country	Cumshock	Beginning	End	Duration	Country	Cumshock	Beginning	End	Duration
Algeria	-86.6%	1980	1998	19	Libya	-90.5%	1980	1998	19
Angola	-90.8%	1980	1998	19	Mali	-44.2%	1995	1999	5
Armenia	-61.6%	1979	1986	8	Mauritania	-86.4%	1973	2002	30
Armenia	-50.4%	1988	1993	6	Mongolia	-45.7%	1995	1999	5
Australia	-51.2%	1980	1986	7	Mozambique	-48.1%	1979	1982	4
Azerbaijan	-88.5%	1980	1998	19	Mozambique	-51.0%	1988	1993	6
Bahrain	-44.3%	1983	1986	4	Myanmar	-70.4%	1979	2002	24
Benin	-45.4%	1983	1986	4	Namibia	-45.5%	1988	1993	6
Bhutan	-44.9%	1974	1975	2	New Zealand	-48.3%	1979	1985	7
Bhutan	-44.4%	1979	1982	4	Niger	-76.0%	1979	1998	20
Bhutan	-48.3%	1995	2001	7	Nigeria	-90.1%	1980	1998	19
Bolivia	-78.7%	1980	1999	20	Norway	-84.8%	1980	1998	19
Botswana	-85.0%	1974	2003	30	Oman	-88.5%	1980	1998	19
Brunei	-87.0%	1980	1998	19	Qatar	-87.0%	1980	1998	19
Burkina Faso	-87.2%	1974	2002	29	Republic of Congo	-87.5%	1980	1998	19
Burundi	-88.2%	1977	2001	25	Russia	-83.2%	1980	1998	19
Cameroon	-77.7%	1979	1998	20	Saudi Arabia	-90.2%	1980	1998	19
Central African Republic	-59.9%	1979	1985	7	Senegal	-74.3%	1979	2002	24
Chad	-88.3%	1980	1998	19	Sierra Leone	-84.4%	1977	2003	27
Chile	-45.7%	1995	1999	5	Solomon Islands	-58.0%	1977	1985	9
Colombia	-77.0%	1980	1998	19	Sudan	-87.1%	1980	1998	19
Cote d'Ivoire	-46.1%	1979	1982	4	Suriname	-52.1%	1980	1982	3
Dem. Rep. of Congo	-75.9%	1979	2002	24	Suriname	-53.5%	1988	1993	6
Ecuador	-79.8%	1980	1998	19	Syria	-85.4%	1980	1998	19
Equatorial Guinea	-90.3%	1980	1998	19	Tajikistan	-54.3%	1979	1982	4
Ethiopia	-90.5%	1977	2001	25	Tajikistan	-59.0%	1988	1993	6
Gabon	-85.4%	1980	1998	19	Togo	-75.8%	1974	2001	28
Ghana	-84.7%	1977	2000	24	Trinidad and Tobago	-84.2%	1980	1998	19
Guinea	-52.0%	1980	1982	3	Turkmenistan	-85.3%	1980	1998	19
Guinea	-55.0%	1988	1993	6	Uganda	-86.0%	1977	2002	26
Guyana	-77.3%	1980	2002	23	United Arab Emirates	-86.4%	1980	1998	19
Iceland	-50.1%	1973	1975	3	Uruguay	-71.3%	1979	2001	23
Iceland	-72.5%	1988	2002	15	Venezuela	-88.9%	1980	1998	19
Indonesia	-75.1%	1979	1999	21	Vietnam	-75.0%	1980	1998	19
Iran	-89.7%	1980	1998	19	Yemen	-89.4%	1980	1998	19
Iraq	-91.2%	1980	1998	19	Zambia	-87.3%	1974	2002	29
Kazakhstan	-85.3%	1980	1998	19	Zimbabwe	-47.8%	1980	1986	7
Kenya	-75.2%	1977	2002	26	Zimbabwe	-46.4%	1989	1993	5
Kuwait	-89.3%	1980	1998	19					

Cumshock: Refers to the cumulative price growth from the beginning to the end of each episode

Table 3.2: Commodity price bust episodes

3.4. Empirical results

3.4.1. Cointegration analysis

To begin with, table 3.3 provides some estimates of panel unit root tests on our interest variables using the Maddala and Wu (1999) test and the cross-section dependence robust Pesaran (2007) test. Thanks to dynamic unreported results we have set the number of lags to 2 without a trend for CSCPI and to 1 for our concentration index with a trend.

While the results unanimously fail to reject the unit root hypothesis for ln(CSCPI), the results are mixed for our concentration index. In fact, the Maddala and Wu test (1999) rejects the presence of a unit root test, while the Pesaran test fails to reject the unit root hypothesis on the specification with trend but reject it on the specification without trend. Due to the significance of a trend in the concentration index data process and to the importance of cross-section dependence[68] in our sample we rely on the estimates that fails to reject the hypothesis of a unit root even though it is the only reported result which do so.

Variable	With trend				Without trend			
	Maddala and Wu (1999)		Pesaran (2007)		Maddala and Wu (1999)		Pesaran (2007)	
	Chi^2	P-Value	Zt-bar	P-Value	Chi^2	P-Value	Zt-bar	P-Value
ln(Conc Index)	201.884	0.002	-1.129	0.129	216.822	0.000	-3.145	0.001
ln(CSCPI)	73.408	1.000	1.656	0.951	120.119	0.955	3.196	0.999

Table 3.3: Panel unit root tests

We now turn our attention to the estimation of the potential cointegration relationship on different country groupings in table 3.4. For every specification we fail to reject the difference between the coefficients estimated thanks to the MG model and those estimated with the PMG which seems to validate the hypothesis of long-run coefficients homogeneity. Regarding the Westerlund cointegration tests, it is striking to realize that we reject the hypothesis of no cointegration for the whole panel for our main regression as well as with our energy and exhaustible equations. However, we fail to reject the no cointegration hypothesis for the 4 test statistics with the food, agricultural raw materials and mining groupings.

When looking at the PMG estimates, we remark that the speed of adjustment is significantly negative which is the sign of a strong reversion towards the long-run relationship[69]. Moreover, the long run coefficient for the CSCPI variations is always significantly positive apart from the agricultural raw materials estimation. Regarding the short-run impact of CSCPI variations we find a significant positive impact aside from agricultural raw materials and mining regressions, while the lagged variations are

[68] We have performed some unreported Pesaran (2004) tests which strongly reject the hypothesis of cross-section independence in our panel.

[69] The speed of adjustment -0.223 in the main specification corresponds to a duration of 2.75 years in order to eliminate 50% of an exogenous shock (often referred as the half-life) and 5.49 years in order to eliminate 75%.

only significant twice and have an impact from two to three times weaker on the concentration index. As a result, we won't introduce lagged variations of CSCPI in the analysis and will keep on with the contemporaneous variation. We could also note that only for the energy category the short run coefficient exceeds the long run coefficient, but this point necessitates further analysis in order to deduce something consistent about it.

To sum up, commodity dependent countries have experienced both a short-run and a long-run relationship which leads to a concentration of exports following a commodity price increase or a diversification of exports following a commodity price drop. However, as evidenced by our results this effect may be triggered by producers of exhaustible resources, especially hydrocarbon producers.

	(1) Main	(2) Food	(3) Rawagri	(4) Mining	(5) Energy	(6) Exhaustible
LR						
ln(CSCPI)	0.063***	0.098***	-0.062	0.117***	0.041***	0.052***
	(7.796)	(7.454)	(-1.408)	(6.430)	(4.785)	(6.073)
SR						
EC_{t-1}	-0.223***	-0.266***	-0.298***	-0.272***	-0.219***	-0.228***
	(-9.981)	(-6.280)	(-7.034)	(-6.071)	(-6.161)	(-8.320)
$\Delta ln(CSCPI)_t$	0.049***	0.043**	-0.006	0.014	0.063***	0.048***
	(4.806)	(2.243)	(-0.232)	(0.562)	(6.240)	(4.203)
$\Delta ln(CSCPI)_{t-1}$	-0.008	-0.022**	-0.022	-0.039	0.020***	0.002
	(-0.775)	(-2.011)	(-1.001)	(-1.432)	(2.988)	(0.161)
Constant	0.250***	0.217***	0.527***	0.234***	0.294***	0.287***
	(9.058)	(4.849)	(6.580)	(5.312)	(6.055)	(7.916)
N	2692	797	213	777	1316	1976
N of countries	74	21	6	21	36	54
Hausman (P-Value)	0.346	0.337	1.000	0.186	0.174	0.598
Westerlund Gt stat (P-Value)	0.071	0.104	0.627	0.455	0.009	0.045
Westerlund Ga stat (P-Value)	0.806	0.681	0.840	0.915	0.236	0.664
Westerlund Pt stat (P-Value)	0.000	0.252	0.177	0.143	0.000	0.000
Westerlund Pa stat (P-Value)	0.001	0.235	0.304	0.261	0.000	0.001
* P-Value<0.10, ** P-Value <0.05, *** P-Value <0.01						

EC_{t-1}: Error correction term
Hausman (P-Value): P-Value for the Hausman test of the non-systematic difference between the coefficients for the MG and PMG estimates.
The upper part of the table refers to the long-run relationship (LR) while the bottom part refers to the short run coefficients (SR).

Table 3.4: Pooled Mean Group estimations

3.4.2. Common correlated effects estimators

3.4.2.1. Main estimations

While the previous section has evidenced a positive relationship between commodity price variations and export concentration both in the short run and in the long run, this model fails to take into account the global common factors impacting differently every country through both dependent and independent variables of our model, which motivates the analysis of our CCEMG results.

In table 3.5.a, we find a strongly significant positive and stable impact of CSCPI variations on the evolution of our export concentration index across every specification. The average coefficient of 0.118 across our 7 columns show that a 10% increase in commodity prices is associated to a slightly more than 1% increase in export concentration[70]. Even though this quantitative impact may seem low, we should remind that it corresponds only to the contemporaneous response to commodity price variations. The analysis of commodity price booms and busts episodes in next section will take into account longer-run effects on diversification. We should also note that REER appreciation and a decrease in the GFCF share are also slightly linked with export concentration.

The pattern is quite identical regarding estimates based on the intensive margin index in table 3.5.b but with a more salient impact of REER appreciations. However, in table 3.5.c CSCPI variations only impact the extensive margin index when the financial development is included in the regression, while improvements in the stock of human capital seem to be the main determinants of extensive diversification, that is to say the creation of new exports lines.

Finally, our model fails to explain correctly the variations of the relative quality of exported goods in table 3.5.d as well as the evolution of the manufacturing value-added share in table 3.5.e, even though we find some consistent impact of REER depreciation on manufacturing value-added share growth.

[70] The interpretation could also be reversed with a 10% decrease in commodity prices being associated with a slightly more than 1% decrease in export concentration (or increase in export diversification).

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	Δln(Conc index)						
Δln(CSCPI)	0.127***	0.127***	0.113***	0.119***	0.089***	0.114***	0.138***
	(5.333)	(5.999)	(5.322)	(4.026)	(3.887)	(4.651)	(5.624)
Δln(REER)	0.030**	0.019	0.028*	0.040**	0.021	0.016	0.039**
	(2.272)	(1.338)	(1.927)	(2.142)	(1.365)	(1.144)	(2.221)
ln(GFCFshare)	-0.013*	-0.013*	-0.010	-0.017**	-0.003	-0.011	-0.005
	(-1.900)	(-1.693)	(-1.088)	(-2.064)	(-0.362)	(-1.181)	(-0.695)
ln(School)	-0.018	-0.020	-0.033**	-0.028	-0.024	0.003	-0.020
	(-1.633)	(-1.136)	(-2.123)	(-1.337)	(-1.381)	(0.187)	(-1.275)
vol(CSCPI)	-0.003						
	(-1.442)						
ln(Pop active)		0.009					
		(0.228)					
$\ln(\frac{M}{GDP})$			-0.020*				
			(-1.718)				
ln(Financial dev)				0.003			
				(0.368)			
Capital open					0.012		
					(0.822)		
Democracy level						-0.017	
						(-1.339)	
ln(PPP GDP pc)							0.038**
							(2.037)
N	2386	2383	2386	2009	2190	2310	2272
N of countries	72	72	72	70	72	71	72
Wald Chi²	41.958	41.980	40.676	26.980	19.685	26.168	42.822
* P-Value<0.10, ** P-Value <0.05, *** P-Value <0.01							

The constant is not reported in the table above

Table 3.5.a: Mean-Group Common-correlated effects (CCEMG) estimates for the concentration index

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	Δln(Int margin)						
Δln(CSCPI)	0.089***	0.116***	0.102***	0.122***	0.098***	0.114***	0.117***
	(3.553)	(4.706)	(4.530)	(4.300)	(4.391)	(4.549)	(4.250)
Δln(REER)	0.053***	0.031*	0.047**	0.054***	0.017	0.023	0.035**
	(3.309)	(1.798)	(2.510)	(2.960)	(0.979)	(1.329)	(2.114)
ln(GFCFshare)	-0.014*	-0.012	-0.018	-0.016	-0.006	-0.011	-0.011
	(-1.950)	(-1.515)	(-1.442)	(-1.638)	(-0.676)	(-1.042)	(-1.382)
ln(School)	0.019	0.031	0.040*	-0.028	-0.002	0.033*	0.012
	(1.178)	(1.229)	(1.932)	(-1.088)	(-0.092)	(1.813)	(0.639)
vol(CSCPI)	-0.005*						
	(-1.733)						
ln(Pop active)		0.122**					
		(2.365)					
$\ln(\frac{M}{GDP})$			-0.013				
			(-0.771)				
ln(Financial dev)				0.001			
				(0.149)			
Capital open					0.029		
					(1.092)		
Democracy level						-0.017	
						(-1.166)	
ln(PPP GDP pc)							0.023
							(0.980)
N	2386	2383	2386	2009	2190	2310	2272
N of countries	72	72	72	70	72	71	72
Wald Chi²	31.766	34.782	33.229	31.141	21.892	28.189	25.812
* P-Value<0.10, ** P-Value <0.05, *** P-Value <0.01							

The constant is not reported in the table above

Table 3.5.b: Mean-Group Common-correlated effects (CCEMG) estimates for the intensive margin index

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	Δln(Ext margin)						
Δln(CSCPI)	0.100	0.042	0.034	0.260***	0.043	0.034	0.078
	(1.291)	(0.411)	(0.400)	(3.683)	(0.601)	(0.470)	(0.873)
Δln(REER)	-0.062	-0.089*	-0.044	-0.073	-0.058	-0.087*	-0.058
	(-1.098)	(-1.709)	(-0.867)	(-1.311)	(-0.937)	(-1.774)	(-1.186)
ln(GFCFshare)	0.020	0.030	-0.018	-0.042	-0.024	-0.007	0.014
	(0.443)	(0.704)	(-0.424)	(-0.846)	(-0.722)	(-0.133)	(0.440)
ln(School)	-0.163**	-0.150**	-0.163**	-0.177*	-0.114**	-0.248***	-0.087
	(-2.304)	(-2.099)	(-2.258)	(-1.793)	(-2.378)	(-3.158)	(-1.344)
vol(CSCPI)	-0.019						
	(-1.374)						
ln(Pop active)		-0.416*					
		(-1.748)					
$\ln(\frac{M}{GDP})$			-0.039				
			(-0.620)				
ln(Financial dev)				-0.002			
				(-0.062)			
Capital open					0.045		
					(0.736)		
Democracy level						-0.062	
						(-0.949)	
ln(PPP GDP pc)							0.014
							(0.098)
N	2317	2314	2317	1965	2135	2244	2210
N of countries	72	72	72	69	72	71	72
Wald Chi²	10.267	11.049	6.573	19.217	7.957	14.262	4.178
* P-Value<0.10, ** P-Value <0.05, *** P-Value <0.01							

The constant is not reported in the table above

Table 3.5.c: Mean-Group Common-correlated effects (CCEMG) estimates for the extensive margin index

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	Δln(Quality index)						
Δln(CSCPI)	-0.037*	-0.031	-0.004	-0.019	-0.029	-0.007	-0.013
	(-1.927)	(-1.354)	(-0.184)	(-0.764)	(-1.224)	(-0.321)	(-0.539)
Δln(REER)	-0.020	-0.011	-0.018	-0.012	-0.022	-0.013	-0.007
	(-1.361)	(-0.631)	(-1.256)	(-0.575)	(-1.209)	(-0.896)	(-0.497)
ln(GFCFshare)	0.011*	0.011	0.016	0.016	0.004	0.025***	0.007
	(1.785)	(1.403)	(1.579)	(1.487)	(0.343)	(2.779)	(0.884)
ln(School)	-0.008	0.014	-0.001	0.002	0.005	-0.009	0.015
	(-0.622)	(0.956)	(-0.080)	(0.079)	(0.246)	(-0.587)	(0.958)
vol(CSCPI)	0.005*						
	(1.655)						
ln(Pop active)		-0.036					
		(-0.741)					
$\ln(\frac{M}{GDP})$			0.013				
			(1.197)				
ln(Financial dev)				-0.007			
				(-0.727)			
Capital open					0.004		
					(0.207)		
Democracy level						0.021	
						(1.134)	
ln(PPP GDP pc)							-0.005
							(-0.201)
N	2279	2276	2279	1909	2106	2204	2192
N of countries	72	72	72	70	72	71	72
Wald Chi²	11.874	5.660	5.544	3.661	3.179	10.256	2.277
* P-Value<0.10, ** P-Value <0.05, *** P-Value <0.01							

The constant is not reported in the table above

Table 3.5.d: Mean-Group Common-correlated effects (CCEMG) estimates for the relative quality index

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	Δln(Manu share)						
Δln(CSCPI)	-0.024	-0.023	-0.040	-0.039	-0.048	-0.024	-0.039
	(-0.826)	(-0.689)	(-1.229)	(-0.977)	(-1.307)	(-0.744)	(-1.038)
Δln(REER)	-0.060*	-0.068*	-0.040	-0.062	-0.077*	-0.034	-0.101**
	(-1.751)	(-1.789)	(-1.244)	(-1.176)	(-1.660)	(-0.915)	(-2.552)
ln(GFCFshare)	-0.009	0.010	-0.019	-0.043*	-0.037	-0.005	0.001
	(-0.485)	(0.512)	(-0.693)	(-1.839)	(-1.617)	(-0.237)	(0.048)
ln(School)	0.011	0.059*	-0.004	-0.003	0.026	0.014	0.014
	(0.352)	(1.687)	(-0.111)	(-0.086)	(0.662)	(0.401)	(0.397)
vol(CSCPI)	-0.002						
	(-0.324)						
ln(Pop active)		0.016					
		(0.188)					
$\ln(\frac{M}{GDP})$			0.045*				
			(1.651)				
ln(Financial dev)				0.030**			
				(2.020)			
Capital open					0.003		
					(0.074)		
Democracy level						-0.050*	
						(-1.742)	
ln(PPP GDP pc)							0.012
							(0.300)
N	2601	2598	2601	2160	2327	2476	2461
N of countries	76	76	76	75	75	74	76
Wald Chi²	4.212	6.818	6.276	9.805	7.525	4.642	7.842
* P-Value<0.10, ** P-Value <0.05, *** P-Value <0.01							

The constant is not reported in the table above

Table 3.5.e: Mean-Group Common-correlated effects (CCEMG) estimates for the manufacturing VA share

3.4.2.2. Robustness checks

In this section, we provide some robustness checks for our main specification.

We try to enter every dependent variable in diff-log form to be sure we are catching a within-country variation of our variables (Section 3.6.2). Then we test the inclusion of the lagged log version of our dependent variable among our determinants to assess the sensitivity to a dynamic specification (Section 3.6.3). Even though the lagged term is highly significant our CSCPI coefficients are still strongly significant even though the quantitative impact is slightly reduced. While promising, this specification suffers from the traditional endogeneity problem arising when a lagged dependent variable is included with the dependent variables because it becomes correlated with the residuals. One possibility would be to use a Difference or System-GMM estimator which is often used in those cases to tackle the endogeneity trouble, but it can be problematic to find relevant instruments when the time dimension of our panel becomes relatively high and the cross-section dimension relatively low. Moreover, our empirical panel warrants the necessity to tackle the parameter heterogeneity as well as the cross-section dependence, which guards us from using it. An alternative could have been to use 5-year averages often used to get rid of cyclical variations, but our aim is exactly to assess the impact of short-run disturbances, namely commodity price variations so it cannot be a solution. Being aware of the endogeneity trouble in this regression, it seems relevant to use it only as a sensitivity analysis to check the stability and significance of our coefficients.

We then provide sensitivity to the country selection of our sample. We remove countries whose average population over our time period is below 1 million which removes 8 countries[71] (Section 3.6.4). To stress the exogeneity of our CSCPI shocks, we remove from our sample current OPEC countries[72] apart from Angola which joined in 2007 and add former member Gabon (Section 3.6.5). Our last robustness check consists in estimating our main specification using REER indices computed thanks to the WEO GDP deflator and the WEO CPI instead of the PWT 8.0 GDP deflator (Section 3.6.6).

It appears that none of these estimations call into question our previous results regarding the impact of commodity price variations on our diversification indicators. Commodity price variations have induced an export concentration through the intensive margin that is to say through a decrease in the balance of already existing activities. However, estimates on the extensive margin, the relative quality index or the manufacturing share are weak to no significant.

3.4.3. Analysis of commodity price booms and busts episodes

While our econometric specifications have been illustrative of the role of commodity price variations in explaining diversification patterns, we may remind that our previous results have been computed on the whole sample. On top of that we have mostly focused on the contemporaneous impact of commodity price variations on diversification outcomes. However, these fluctuations could also impact the diversification pattern in the longer run as shown by the PMG estimates in section 3.4.1.

[71] Iceland, Guyana, Suriname, Bahrain, Qatar, Bhutan, Equatorial Guinea, Solomon Islands.
[72] These countries are Algeria, Ecuador, Indonesia, Iran, Iraq, Kuwait, Libya, Nigeria, Qatar, Saudi Arabia, United Arab Emirates, and Venezuela.

Based on the commodity price booms and busts identified in section 3.3; we present in this section the evolution of our diversification indicators during these periods[73]. The point of this section is not to provide a true causal relationship from commodity price variations to trade diversification ruling out the evolution of other determinants over time. Instead, we have computed and tested the difference between the end and beginning of the period log forms of our diversification indices.

It would have been better to compare years before the boom with years after the boom, but our time sample limit this possibility because we miss numerous pre-boom observations for the 1970s commodity price booms as well as post-boom observations for the 2000s booms. As a result, assessing the evolution of our indicators between the beginning and the end of these episodes provide a relevant second-best option.

We will also provide some analysis comparing the evolution of export diversification during 1970s and 2000s commodity price booms.

Boom episodes				**Bust episodes**			
Variable	Diff.	P-Value	N	Variable	Diff.	P-Value	N
ln(conc index)	0.093***	0.000	85	ln(conc index)	-0.121***	0.000	62
ln(int margin)	0.138***	0.000	85	ln(int margin)	-0.056*	0.057	62
ln(ext margin)	-0.208**	0.028	81	ln(ext margin)	-0.402***	0.001	60
ln(quality index)	-0.041*	0.059	78	ln(quality index)	-0.039	0.160	55
ln(manu share)	-0.147***	0.001	87	ln(manu share)	0.034	0.640	67
ln(CSCPI)	1.377***	0.000	94	ln(CSCPI)	-1.201***	0.000	77
ln(REER)	0.348***	0.000	88	ln(REER)	-0.329***	0.000	67
ln(GFCF share)	0.088*	0.056	87	ln(GFCF share)	0.056	0.457	67
ln(school)	0.297***	0.000	72	ln(school)	0.506***	0.000	61
vol(CSCPI)	2.194***	0.000	94	vol(CSCPI)	-0.315	0.244	77
ln(pop active)	0.121***	0.000	94	ln(pop active)	0.265***	0.000	77
ln(M/GDP)	0.023	0.597	87	ln(M/GDP)	0.212***	0.002	67
ln(financial dev)	1.149***	0.000	66	ln(financial dev)	-0.550**	0.016	45
capital open	0.037	0.115	78	capital open	0.098**	0.018	57
democracy	0.045**	0.047	80	democracy	0.139***	0.000	62
ln(GDP PPP pc)	0.550***	0.000	84	ln(GDP PPP pc)	0.558***	0.000	61

Table 3.6: Test for the non-significance of the difference between the end and beginning of the period outputs

3.4.3.1. Commodity price booms

First, we depict the evolution of diversification outcomes between the end and the beginning of the selected boom episodes. In line with our previous results, figures 3.2.a. and 3.2.b. confirm that

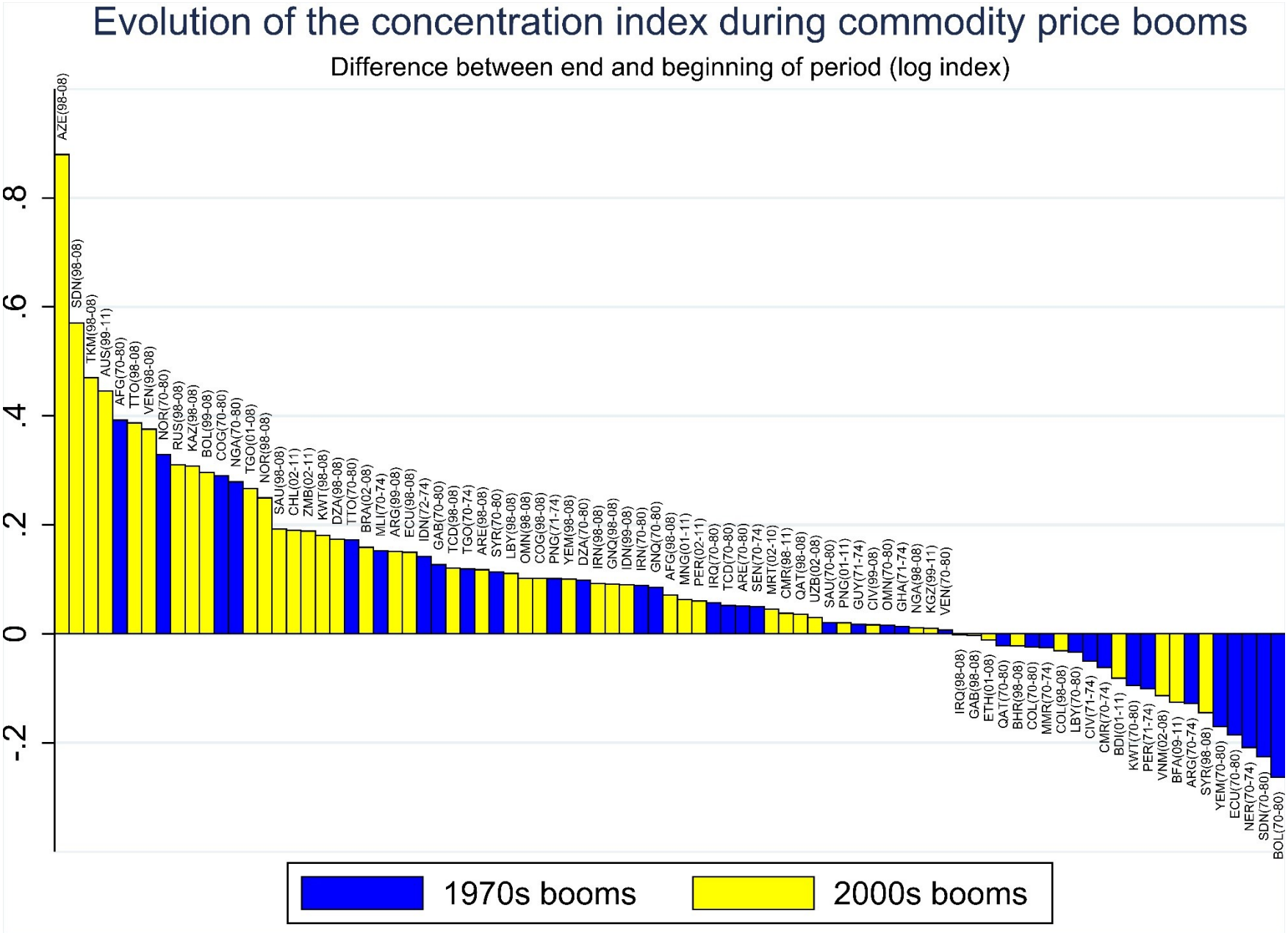
[73] Computations for boom episodes ending in 2011 have been computed until 2010 regarding the 3 indices of diversification and the relative quality index because of data unavailability.

commodity price booms have increased export concentration during most episodes (62/85) especially through an increase in the intensive margin index (64/85). While the pattern regarding the extensive margin component in figure 3.2.c. seems to lean towards a decrease over time, it is dominated by few episodes of strong decrease but is mixed when having a deeper look with mostly as many episodes linked to a decrease (46/81) or an increase of the extensive margin component[74]. The pattern is also mixed regarding the relative quality index in figure 3.2.d. with only a slight majority of commodity price boom episodes related to a decrease in the exported goods quality (43/78). In accordance to the Dutch disease literature, almost two third (56/87) of the boom episodes represented in figure 3.2.e. have shrunk the size of the manufacturing sector.

To complement this first analysis, we have provided in table 3.6 the results for testing the non-significance of the difference between the end and beginning of the period for each output. The results show a highly significant 9.3% increase of export concentration especially through the intensive margin during booms as well as a highly significant 14.7% decrease of the manufacturing value added share. While the 20.6% decrease of the extensive margin component could seem substantial the dominance of outliers in the pattern evidenced previously prevent us from emphasizing this result so much. Finally, the relative quality index slightly decreased but this result is only significant at the 10% margin.

Those results are especially concerning because it evidences the failure from both governments having faced commodity price booms as well as from the private sector as a whole to trigger export diversification. At best the relative quality of their exported goods has not improved despite the commodity windfall and the manufacturing sector having decreased in size certainly through the traditional Dutch disease mechanism. While these concerns may not have been so problematic during those boom episodes, they may have penalized the economy during the subsequent commodity price reversal.

[74] This illustrates the need to provide robustness checks for outliers as we have tackled for our main CCEMG specifications.



<u>Figure 3.2.a</u>: Evolution of the concentration index during commodity price booms

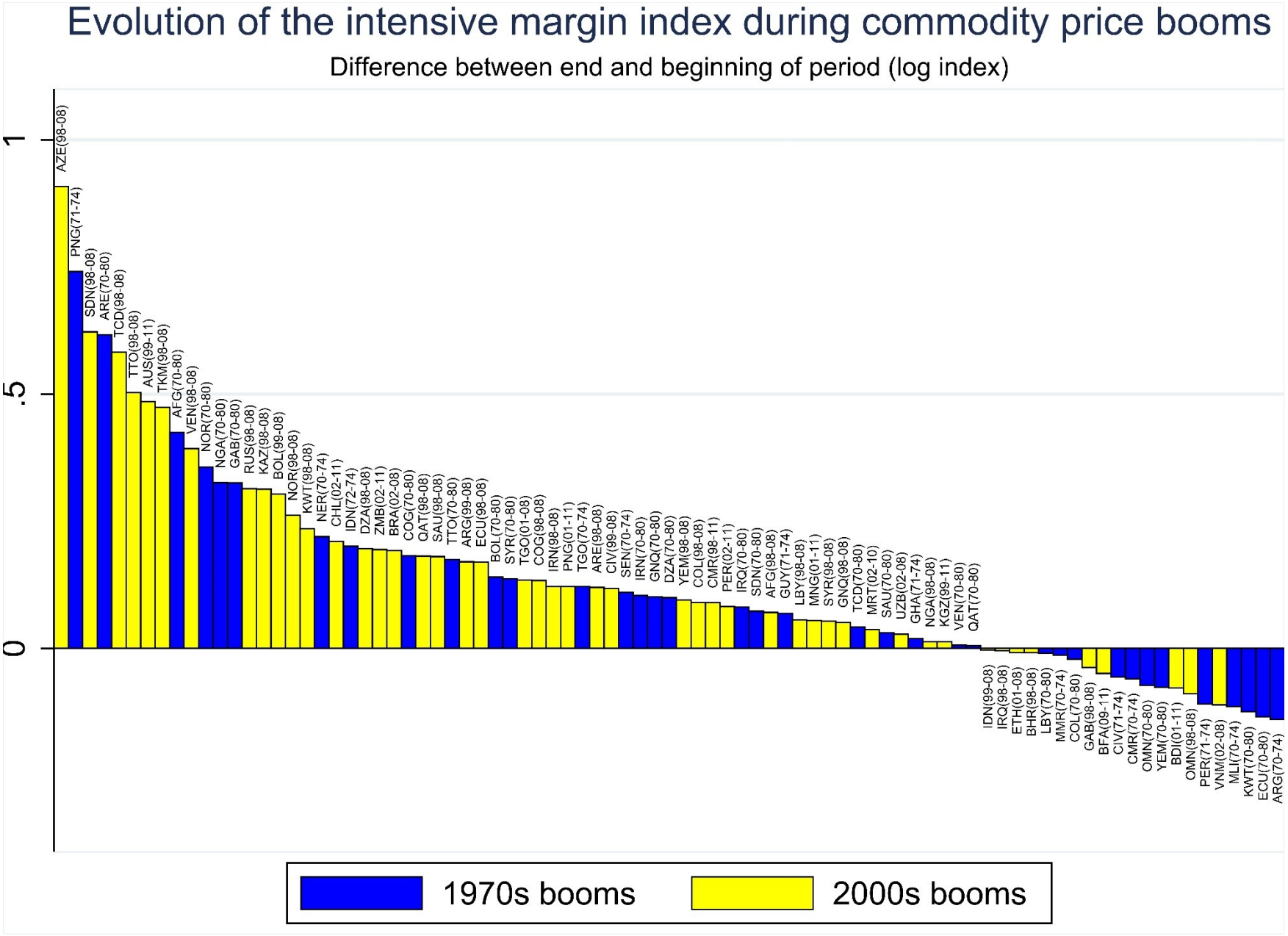


Figure 3.2.b: Evolution of the intensive margin index during commodity price booms

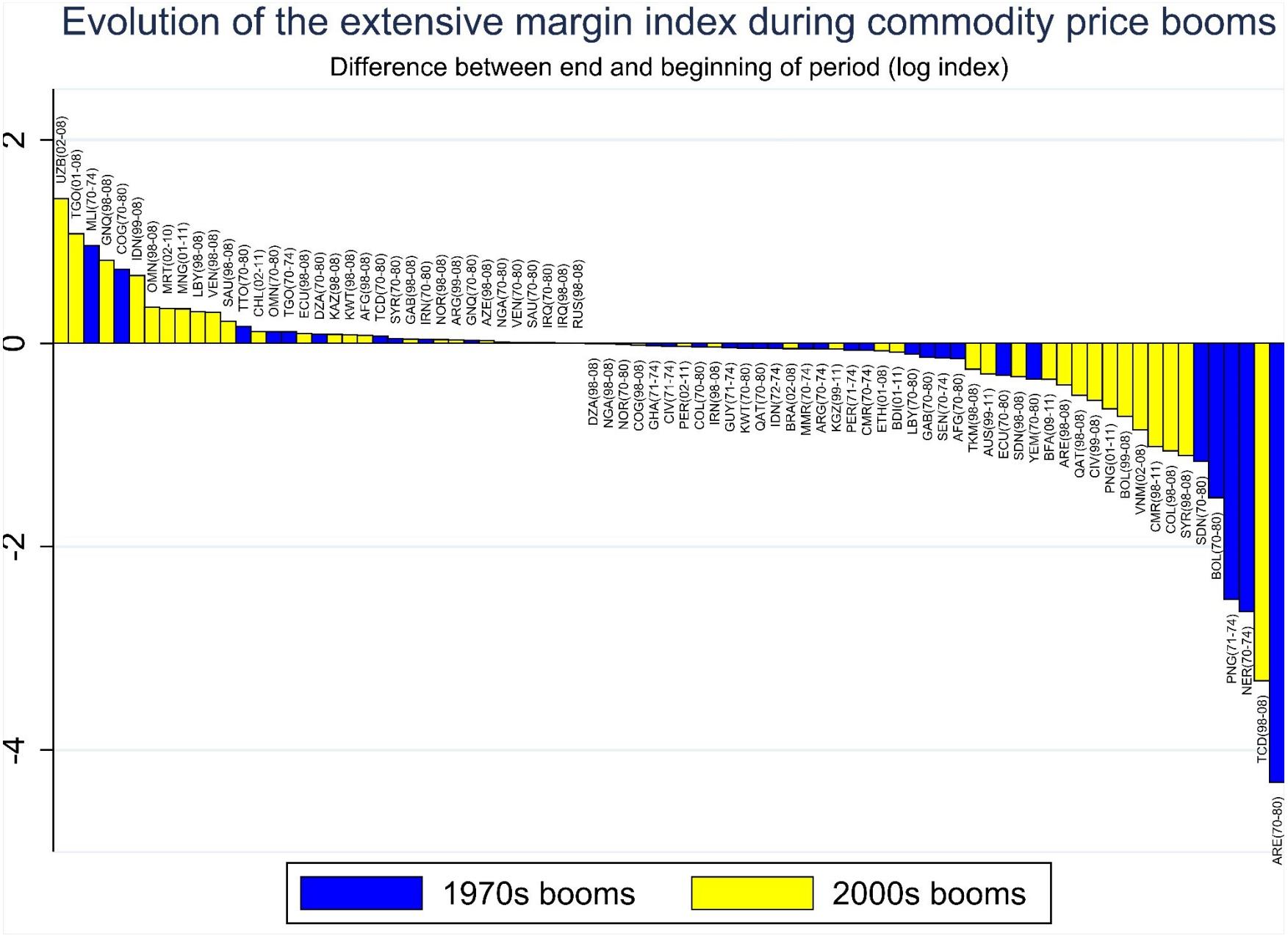
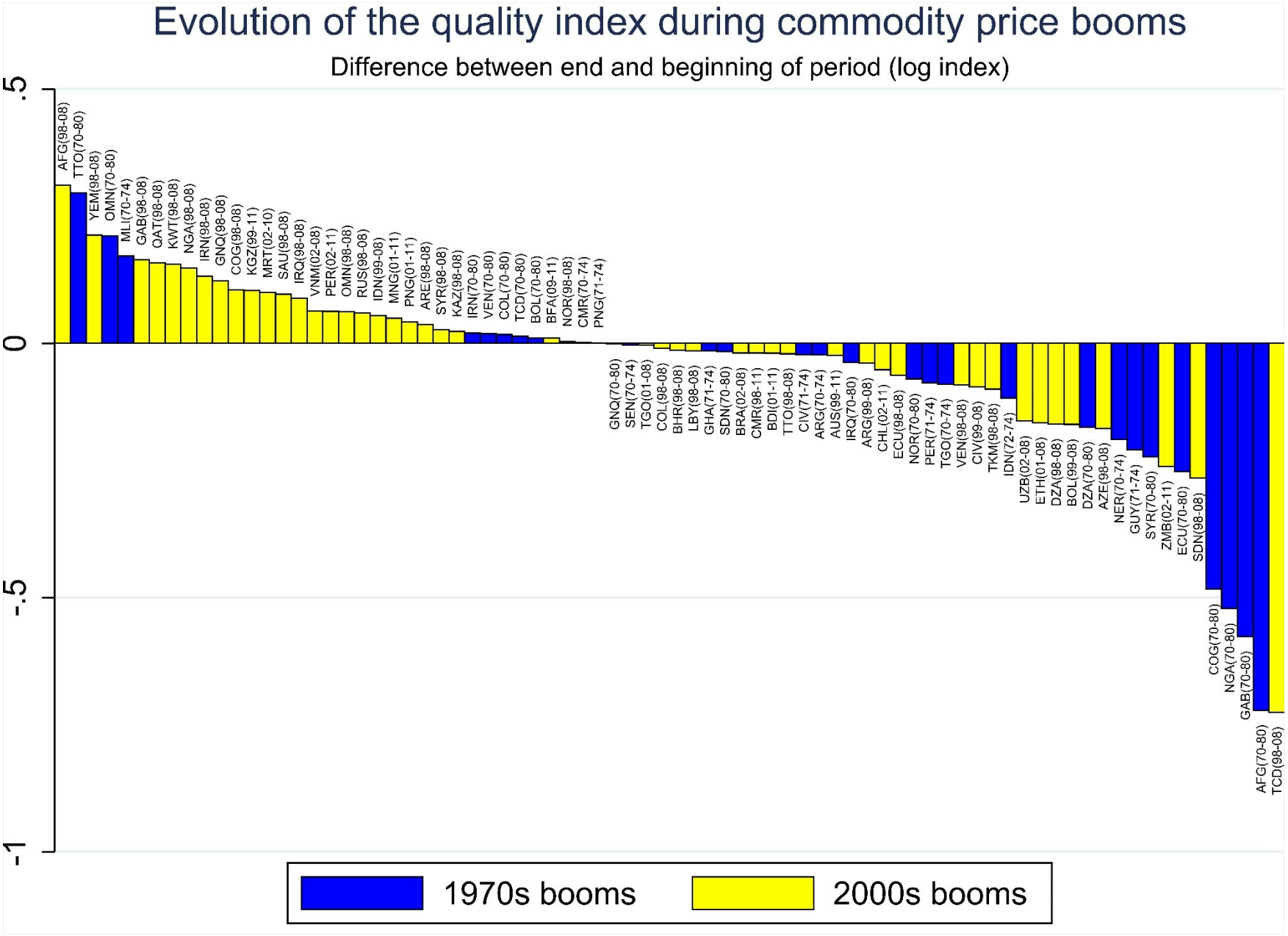
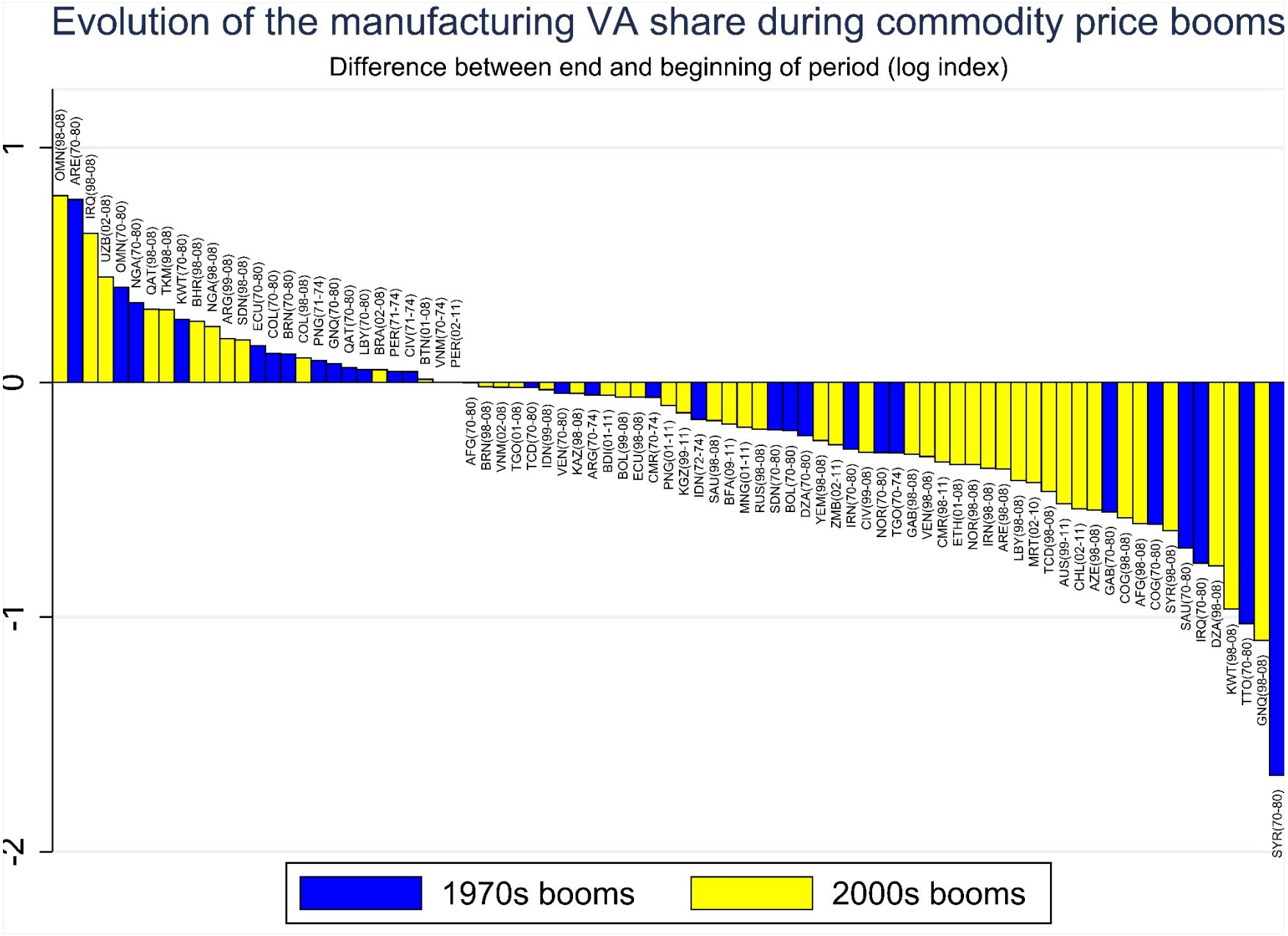


Figure 3.2.c: Evolution of the extensive margin index during commodity price booms



<u>Figure 3.2.d</u>: Evolution of the relative quality index during commodity price booms



<u>Figure 3.2.e</u>: Evolution of the manufacturing VA share during commodity price booms

3.4.3.2. Comparison between the commodity price booms of the 1970s and the 2000s

Unlike our commodity bust episodes, almost half of our commodity price boom episodes occurred during the 1970s and the remaining half during the 2000s which represent two periods of overall commodity price booms. We benefit from this looking at the evolution of the diversification pattern during each boom in table 3.7.

Surprisingly the export concentration index has only significantly increased for episodes in the 2000s with a 14% increase against a non-significant 3.2% increase in the 1970s, while the result remains significant in both cases regarding the intensive margin index. In fact, we may have expected a sounder macroeconomic management during the most recent year as well as a greater care for the diversification agenda in resource dependent countries. It is tempting to draw a parallel with the difficulties of countries like Sudan, Algeria, Venezuela to recover since the commodity price reversal because they have failed to diversify their economy when the money was coming[75]. Some external factors could also explain this pattern: the more competitive trade environment in the 2000s than in the 1970s, the openness and currency undervaluation of East Asian economies including China in the 2000s, or the decrease in trade barriers over time which may have complicated the arrival of newcomers[76].

We find a similar result as before concerning the extensive margin index evolution during the 1970s with a strong but only partly significant decrease dominated by some outliers while the decrease has been weaker and no significant for episodes in the 2000s. This result goes in the same direction giving some indication of fewer new exported products during the 2000s than in the 1970s.

Regarding the decrease in the relative quality index it has only been significant for episodes in the 1970s. Even though the quality did not improve during the last boom, the decrease of the relative quality did not occur like in the 1970s. However, the fact that the manufacturing sector size was significantly reduced (and more strongly) during the 2000s and not in the 1970s is also worrying for the current low commodity price era those countries are facing.

While some may point out that the mean commodity price boom has been 16.5 percentage point higher for the 1970s episodes it doesn't represent a so big difference in comparison with the respective 146.5% and 130% mean cumulative commodity price increases. On top of that with 30 more years of experiences in economics management such a difference in commodity price shock can be hardly seen or even shouldn't explain the weaker performance in the 2000s regarding the diversification and structural transformation indicators.

Despite the small size of our sample and as a result the poor quality of our statistical tests we provide in table 3.8 the results of the non-significance test of the difference between the evolution of one indicator in the 2000s and the evolution of the same indicator in the 1970s restricting our sample to countries having faced both booms. The results fail to provide any significant difference for the evolution of our diversification indicators during both booms even though we find a stronger increase of the overall concentration index at the 10% margin.

If we can see some signs of a less pessimistic pattern for the 2000s episodes than previously, we should not forget the decrease in the quality of the test due to the decrease in the sample size.

[75] For these countries economic difficulties has led to civil uprising and/or civil conflict which may have been hindered or limited with a better care of the diversification agenda during periods of commodity price booms.
[76] I leave the identification of the right explanation to further research.

Moreover, restricting our sample to countries having already faced a comparable boom episode in the 1970s we could have expected a better diversification performance during the 2000s which apparently at best has not been the case

Booms 1970s				Booms 2000s			
Variable	Diff.	P-Value	N	Variable	Diff.	P-Value	N
ln(conc index)	0.032	0.207	37	ln(conc index)	0.140***	0.000	48
ln(int margin)	0.102***	0.004	37	ln(int margin)	0.166***	0.000	48
ln(ext margin)	-0.311*	0.059	37	ln(ext margin)	-0.122	0.260	44
ln(quality index)	-0.101**	0.020	30	ln(quality index)	-0.004	0.861	48
ln(manu share)	-0.114	0.110	38	ln(manu share)	-0.174***	0.002	49
ln(CSCPI)	1.465***	0.000	44	ln(CSCPI)	1.300***	0.000	50
ln(REER)	0.349***	0.000	38	ln(REER)	0.348***	0.000	50
ln(GFCF share)	0.085	0.140	38	ln(GFCF share)	0.090	0.193	49
ln(school)	0.353***	0.000	34	ln(school)	0.246***	0.000	38
vol(CSCPI)	2.267***	0.000	44	vol(CSCPI)	2.130***	0.000	50
ln(pop active)	0.206***	0.000	44	ln(pop active)	0.046*	0.080	50
ln(M/GDP)	0.075	0.243	38	ln(M/GDP)	-0.018	0.758	49
ln(financial dev)	0.950***	0.000	24	ln(financial dev)	1.262***	0.000	42
capital open	0.047	0.119	31	capital open	0.030	0.372	47
democracy	0.056	0.204	32	democracy	0.038	0.121	48
ln(GDP PPP pc)	0.568***	0.000	35	ln(GDP PPP pc)	0.537***	0.000	49

Table 3.7: Test for the non-significance of the difference between the end and beginning of the period outputs during each commodity price boom

Booms 2000s - Booms 1970s					
Variable	Diff 2000s	Diff 1970s	Diff 2000s-Diff 1970s	P-Value	N
ln(conc index)	0.129	0.038	0.091**	0.041	31
ln(int margin)	0.162	0.112	0.049	0.337	31
ln(ext margin)	-0.195	-0.323	0.128	0.559	29
ln(quality index)	-0.012	-0.112	0.099	0.182	25
ln(manu share)	-0.191	-0.116	-0.075	0.464	31
ln(CSCPI)	1.384	1.571	-0.187***	0.000	38
ln(REER)	0.409	0.422	-0.013	0.911	32
ln(GFCF share)	0.047	0.065	-0.018	0.858	31
ln(school)	0.258	0.337	-0.079	0.322	22
vol(CSCPI)	2.332	1.669	0.663	0.155	38
ln(pop active)	0.046	0.226	-0.180***	0.000	38
ln(M/GDP)	-0.049	0.050	-0.099	0.217	31
ln(financial dev)	0.634	1.115	-0.481**	0.021	17
capital open	0.004	0.030	-0.026	0.693	23
democracy	0.004	0.092	-0.088	0.162	25
ln(GDP PPP pc)	0.501	0.640	-0.138*	0.074	30

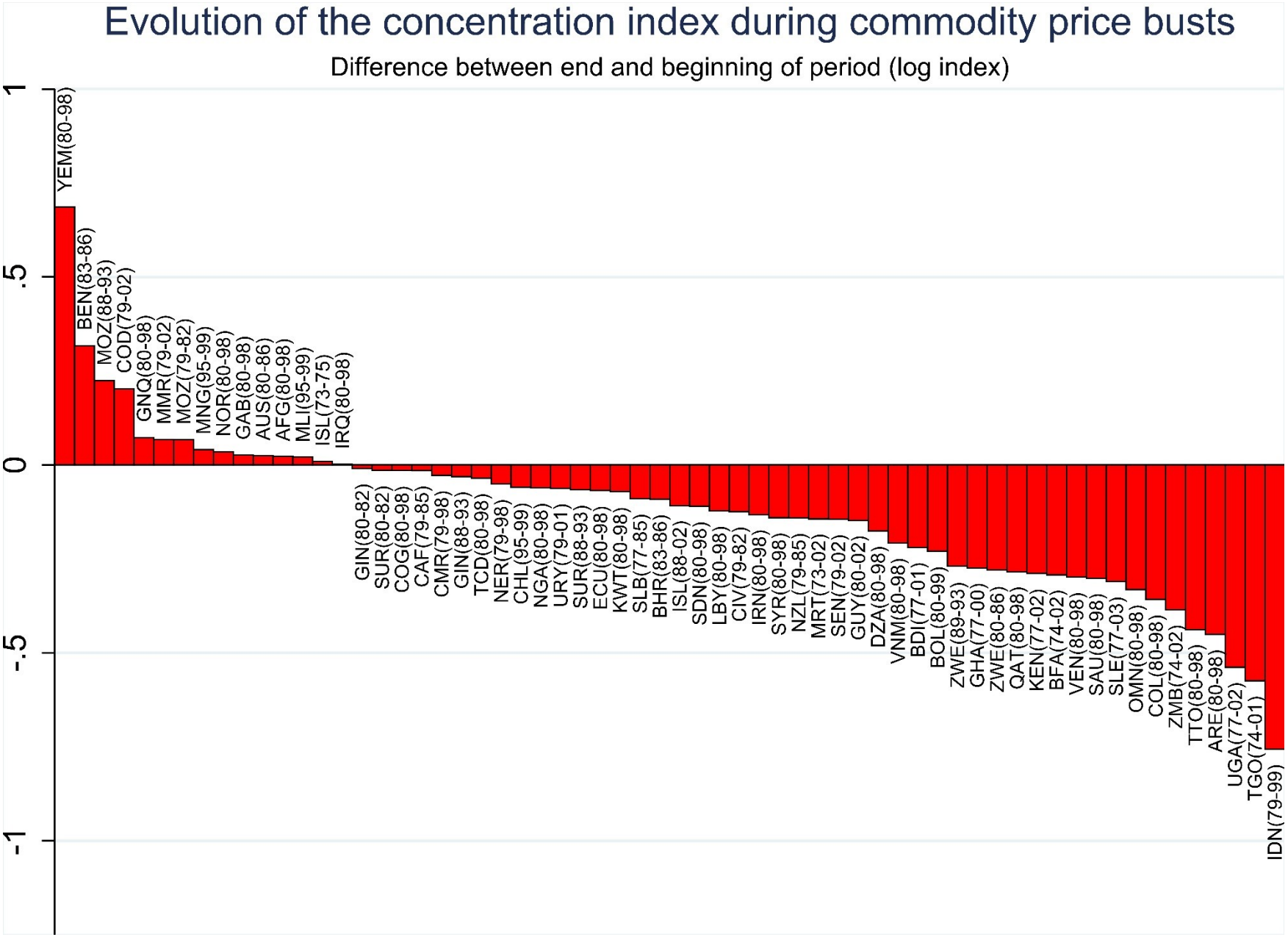
Table 3.8: Test for the non-significance of the difference between each boom output evolution for countries having experienced 2 major commodity price booms

3.4.3.3. Commodity price busts

We now turn our attention to the evolution of our diversification outcomes during bust episodes. Figures 3.3.a. and 3.3.b. evidence a decrease of the concentration index for nearly three quarters of our episodes (47/62) especially through a decrease of the intensive margin index (46/62). It confirms the previously uncovered result of an increase in export diversification during commodity price drops. More interesting, the pattern also holds for the extensive margin component in figure 3.3.c. so that almost three quarters of our busts episodes have seen a decrease of the extensive margin index (44/60). While the pattern is less striking, most commodity price busts episodes has induced a decrease of the relative quality index (34/55) in figure 3.3.d. The pattern is mixed for the manufacturing value added share with only a slight majority of our bust episodes in figure 3.3.e. having been followed by a decrease in the manufacturing sector size (38/67).

Like for the commodity price booms analysis, we have performed some tests for the non-significance of the difference between our end of the period and beginning of the period outcomes in table 3.6. The results confirm the graphical pattern with a highly significant 12.1% decrease of our concentration index during commodity price busts. Even though the intensive margin index decreases, its magnitude is weak and is only significant at the 10% level. However, the extensive margin index has strongly and significantly decreased from 40.2% which is both a stronger and more significant result than the one obtained for commodity price booms. Even though the number of recorded exported products may have increased over time due to reasons unrelated to the diversification, it illustrates a higher direction toward export diversification during commodity price drops than during commodity price booms. Besides, both the relative quality index and the manufacturing share have not significantly evolved during these bust episodes.

These results confirm the increase in export diversification during commodity price busts which put in perspective with the increase in export concentration during commodity price booms gives us a pattern consistent with what we observed in figure 3.1.a. It also provides an explanation for the positive and significant impact of commodity price variations on export concentration evidenced in sections 3.4.1 and 3.4.2. While the relative quality of exported products has not significantly been impacted by commodity price busts, the manufacturing sector doesn't significantly increase in relative size despite the decrease in value of the natural resource value added following the commodity price decrease. Whether countries managed to diversify their economy both through a rebalancing of already exported goods and through the arrival of new exported products, it has not significantly increased the relative manufacturing value added share. It could either be illustrative of new activities with a small value-added importance in the economy or of the development of non-manufacturing goods exports (mostly commodities), even though the former option is more likely.



<u>Figure 3.3.a</u>: Evolution of the concentration index during commodity price busts

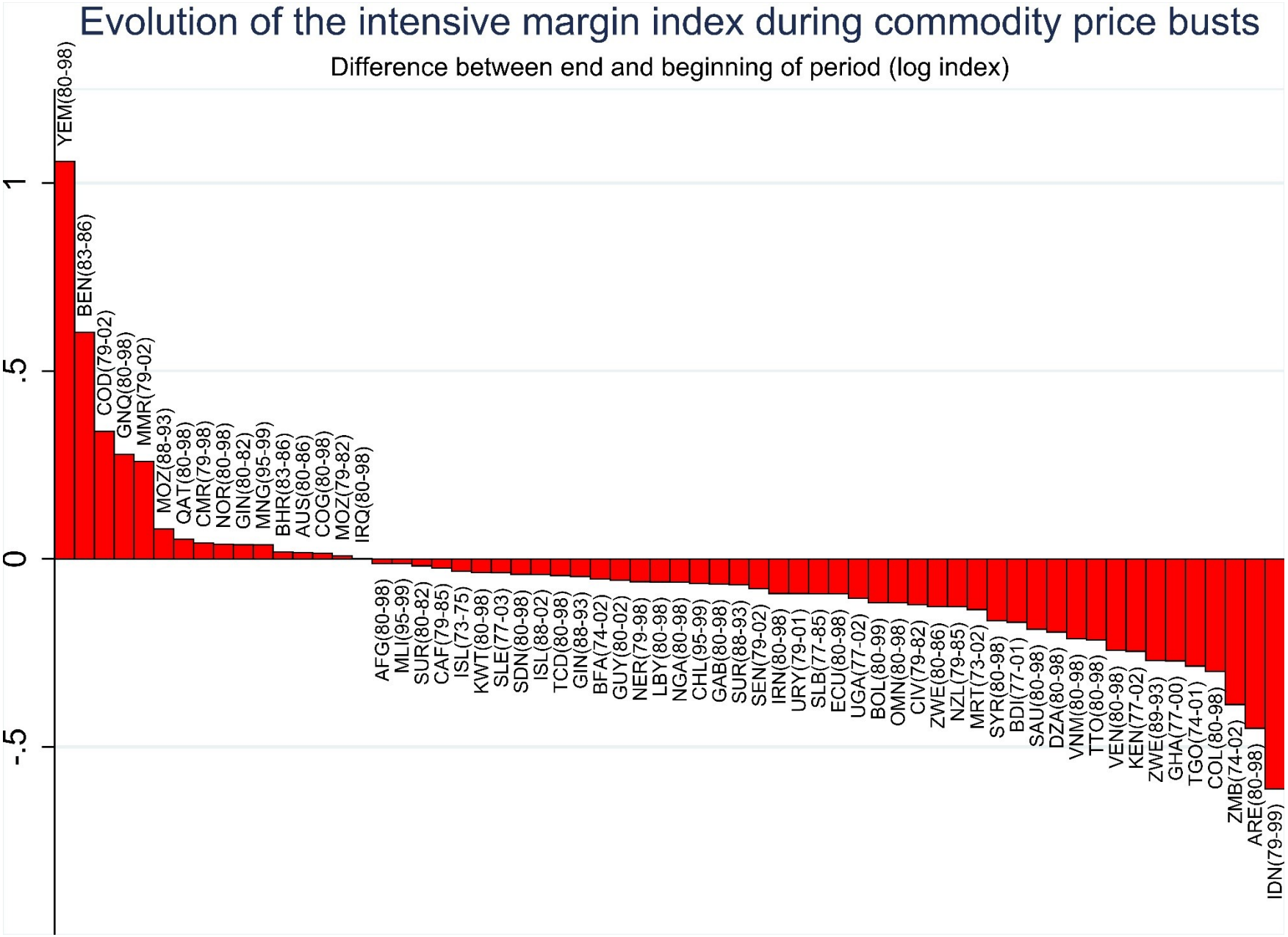
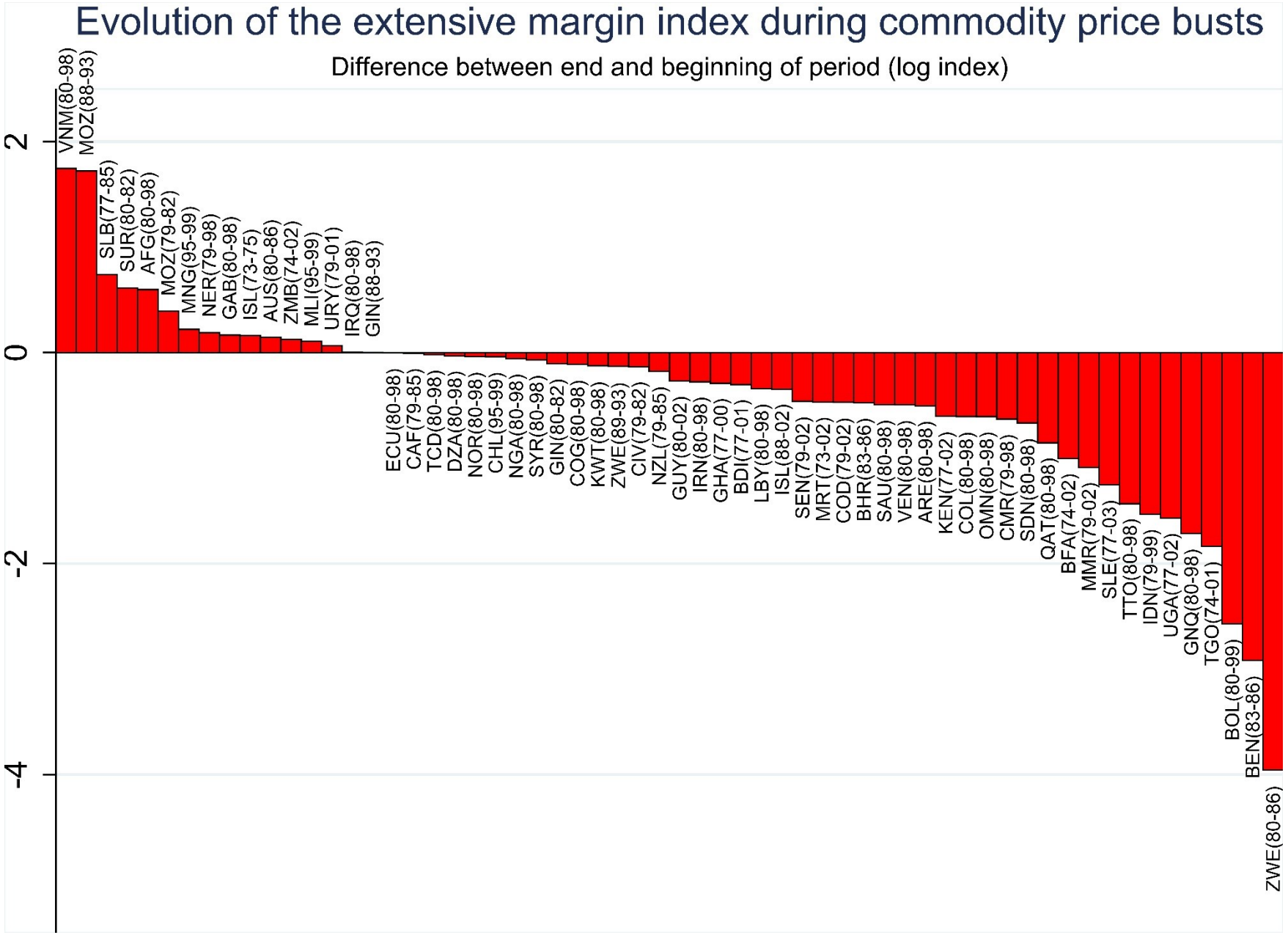
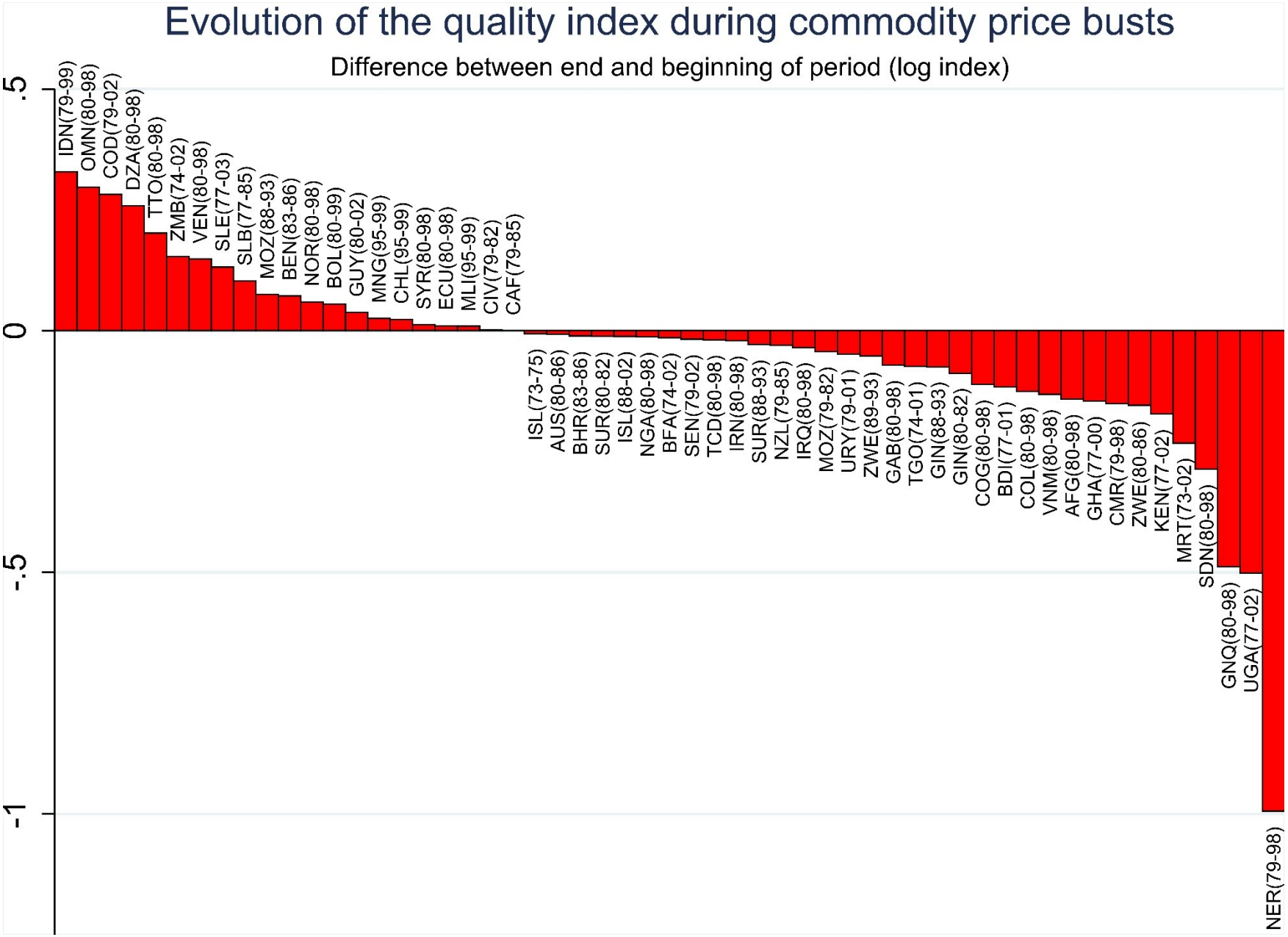


Figure 3.3.b: Evolution of the intensive margin index during commodity price busts



<u>Figure 3.3.c</u>: Evolution of the extensive margin index during commodity price busts



<u>Figure 3.3.d</u>: Evolution of the relative quality index during commodity price busts

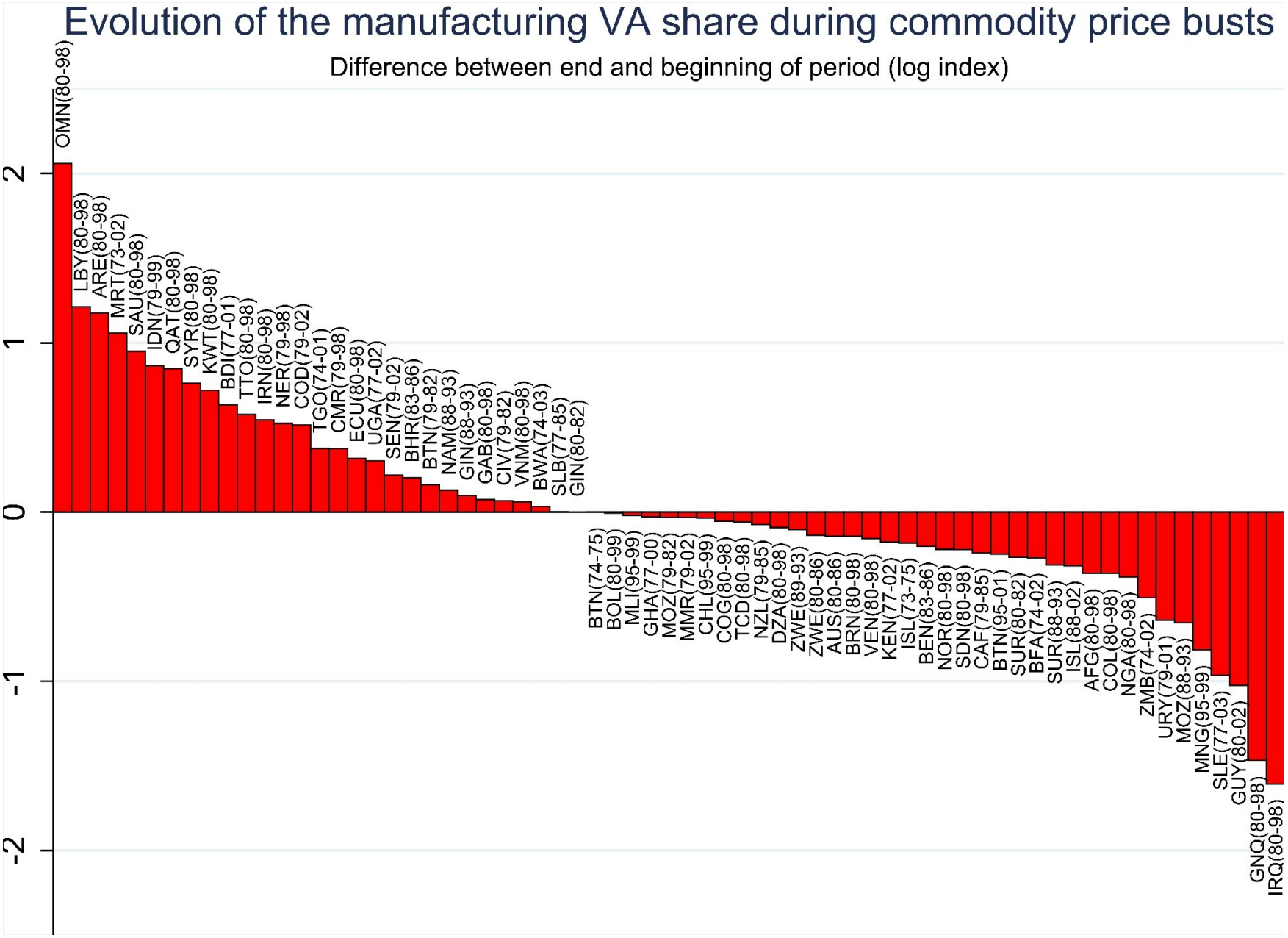


Figure 3.3.e: Evolution of the manufacturing VA share during commodity price busts

3.5. Conclusion

While resource dependent countries currently face an overall commodity price bust, diversifying their economy turned out to be one of the preoccupations at the top of their policy agenda as soon as the commodity prices reversed.

In order to increase our knowledge on the relationship between commodity price booms or busts and the pattern of diversification, this paper has analyzed the impact of commodity price variations on diversification outcomes thanks to a panel of 78 countries over 1970-2012 using successively a cointegration methodology, a dynamic macro-panel model, as well as a discussion analyzing previously selected commodity price boom and bust episodes and the evolution of diversification patterns over these periods.

We have found a strong empirical evidence of a significant impact of commodity price increases on export concentration especially through a more concentrated mix of already exported products (intensive margin), which is robust to model specification, sample changes, as well as alternative control variables. However, we find weak to no evidence for the impact of commodity price variations on the extensive margin of export concentration, the relative quality of exported goods, or the evolution of the manufacturing value added share.

Going deeper into this relationship, we have evidenced that this positive relationship may arise through an increase of export concentration during commodity price booms and an increase of export diversification during commodity price busts. Based on a comparison between commodity booms in the 1970s and the 2000s, we have found some indications of a stronger increase of export concentration during the 2000s commodity price boom which may have increased the recent difficulties for highly resource dependent countries to recover their economy in the context of current low commodity prices.

These results reveal a potential lack of interest from governments to support export diversification when commodity prices are booming. However, commodity prices rarely stay high forever and countries may have only started to implement reforms and investments to diversify when the price reversal left them with a very concentrated and natural resource dependent export basket. While commodity price booms can be an opportunity to diversify most countries did not seize it and may have waited the commodity price fall in order to put more emphasis on the diversification agenda.

Resource dependent countries should put more focus on diversifying their economy as well as investing in key determinants while commodity prices are booming in order to prepare the economy for the following commodity price drop. Because some reforms such as easing business creation or foreign direct investment legal conditions, as well as investing in key sectors such as transportation networks or human capital may positively impact economic diversification in the longer-run, officials should not wait too long before implementing these measures.

While we have been able to compare the diversification evolution between the 1970s and 2000s commodity price booms, it would be interesting to implement a same comparison between the 1980s-1990s commodity price drops and the recent period of commodity price fall. This empirical study would also gain from some analyses on the channels through which commodity price variations could impact export diversification, but we leave this subject for future research.

3.6. Appendices

3.6.1. REER computation

In order to maximize our country and time coverage, we compute our own REER series for each country using a unified procedure based on UNCTAD trade data.

First, we have computed yearly trade weights using a methodology close to Bayoumi et al (2006) even though we distinguish 5 categories of traded goods.

Goods	SITC rev 3 classification
Food	0+1+22+4
Raw agricultural materials	2-22-27-28
Mining and mineral products	27+28+68+667+971
Fuels	3
Manufacturing	5+6+7+8-667-68

Table C.9: Categories of goods used for the REER computations

This weighting scheme takes into account potential 3rd market effects in the manufacturing sector, assign manufacturing weights for service trade, and compute separately weights for the 4 other categories of commodities. While fuels and minerals are often excluded from the trade figures used to compute these weights, it seems problematic when we focus entirely in resource dependent countries whose commodity exports dominate their trade pattern. As a result, we didn't remove those flow because we feel it can proxy potential trade networks between two countries which could be activated one day or the other in order to trade non-commodity goods, and we would lose some information removing those.

The final weight is a weighting average of the 5 category weights and has been computed for each economy-partner pair for each year over 1995-2011. We use the median weight obtained normalized so that each year-specific sum of these new weights sums up to 1.

Even though it is standard in the literature to use the CPI when one what to maximize its country and time coverage, we prefer GDP deflators as our proxies of domestic price factors. In fact, while it seems important to take into account the trending importance of the global value chain, it is difficult to use value added based trade weights. However, it has motivated our choice of GDP deflator as our preferred proxy in order to catch the price linked to produced value added.

We use GDP deflators from the PWT 8.0 because it maximizes our coverage so that our REER is available for 188 over 1990-2011 and for 161 countries over 1970-1989. As robustness checks, we have also computed REER based on the GDP deflator from the WEO and a REER based on the CPI from the WEO.

3.6.2. CCEMG estimations with variables in diff-log form

Specifications using the concentration index

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	Δln(Conc index)						
Δln(CSCPI)	0.103***	0.102***	0.114***	0.140***	0.112***	0.137***	0.116***
	(3.861)	(5.203)	(6.085)	(3.524)	(4.692)	(6.316)	(5.006)
Δln(REER)	0.052**	0.034	0.010	0.047*	0.023	0.032*	0.017
	(2.379)	(1.631)	(0.407)	(1.903)	(1.069)	(1.705)	(0.776)
Δln(GFCFshare)	-0.017	-0.003	-0.048***	-0.014	-0.003	-0.001	-0.009
	(-1.259)	(-0.343)	(-2.870)	(-0.861)	(-0.354)	(-0.064)	(-0.662)
Δln(School)	-0.060*	-0.003	-0.045	-0.039	-0.054	-0.024	-0.044
	(-1.948)	(-0.084)	(-1.470)	(-1.034)	(-1.503)	(-0.792)	(-1.269)
Δvol(CSCPI)	-0.001						
	(-0.235)						
Δln(Pop active)		-0.666					
		(-1.594)					
$\Delta\ln(\frac{M}{GDP})$			0.005				
			(0.258)				
Δln(Financial dev)				-0.006			
				(-0.352)			
ΔCapital open					0.013		
					(0.396)		
ΔDemocracy level						-0.009	
						(-0.418)	
Δln(PPP GDP pc)							0.058
							(1.303)
N	1662	1659	1662	1360	1496	1604	1577
N of countries	67	67	67	60	65	66	65
Wald Chi²	26.002	32.398	47.652	17.976	25.695	43.612	29.411
* P-Value<0.10, ** P-Value <0.05, *** P-Value <0.01							

The constant is not reported in the table above

Table C.10.a: CCEMG estimations in diff-log form using the concentration index

Specifications using the intensive margin index

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	Δln(Int margin)						
Δln(CSCPI)	0.073**	0.117***	0.091***	0.131***	0.086***	0.141***	0.098***
	(2.247)	(4.453)	(3.690)	(3.229)	(3.321)	(4.719)	(3.691)
Δln(REER)	0.030	0.032	0.030	0.018	0.011	0.004	-0.003
	(1.404)	(1.401)	(1.372)	(0.418)	(0.390)	(0.201)	(-0.118)
Δln(GFCFshare)	-0.034*	-0.027	-0.047***	-0.016	-0.006	-0.010	-0.010
	(-1.784)	(-1.570)	(-2.853)	(-0.772)	(-0.486)	(-0.635)	(-0.528)
Δln(School)	-0.087*	-0.041	-0.051	-0.055	-0.016	-0.035	-0.063
	(-1.686)	(-0.905)	(-1.222)	(-1.099)	(-0.410)	(-0.669)	(-1.366)
Δvol(CSCPI)	0.002						
	(0.448)						
Δln(Pop active)		-0.131					
		(-0.283)					
$\Delta\ln(\frac{M}{GDP})$			0.015				
			(0.764)				
Δln(Financial dev)				-0.006			
				(-0.326)			
ΔCapital open					0.013		
					(0.453)		
ΔDemocracy level						0.009	
						(0.362)	
Δln(PPP GDP pc)							-0.043
							(-0.637)
N	1662	1659	1662	1360	1496	1604	1577
N of countries	67	67	67	60	65	66	65
Wald Chi²	13.247	25.157	25.716	12.513	11.793	23.291	16.190
* P-Value<0.10, ** P-Value <0.05, *** P-Value <0.01							

The constant is not reported in the table above

Table C.10.b: CCEMG estimations in diff-log form using the intensive margin index

Specifications using the extensive margin index

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	Δln(Ext margin)						
Δln(CSCPI)	0.150*	0.216***	0.136**	0.180	0.075	0.158**	0.148
	(1.657)	(2.807)	(2.262)	(1.534)	(0.796)	(2.386)	(1.626)
Δln(REER)	0.095	0.024	0.077	-0.018	-0.082	0.018	-0.010
	(1.350)	(0.211)	(0.916)	(-0.187)	(-0.970)	(0.214)	(-0.125)
Δln(GFCFshare)	0.053	0.022	0.061	0.019	0.010	0.037	0.080
	(0.761)	(0.405)	(0.843)	(0.332)	(0.175)	(0.619)	(1.332)
Δln(School)	-0.206	0.054	-0.173	0.041	-0.108	0.013	-0.249*
	(-1.370)	(0.403)	(-0.990)	(0.392)	(-0.675)	(0.089)	(-1.689)
Δvol(CSCPI)	-0.052***						
	(-2.878)						
Δln(Pop active)		-1.954					
		(-0.722)					
$\Delta\ln(\frac{M}{GDP})$			-0.044				
			(-0.698)				
Δln(Financial dev)				0.036			
				(0.721)			
ΔCapital open					-0.009		
					(-0.129)		
ΔDemocracy level						0.021	
						(0.369)	
Δln(PPP GDP pc)							0.176
							(0.802)
N	1622	1619	1622	1345	1468	1565	1544
N of countries	67	67	67	60	65	66	65
Wald Chi²	15.308	8.770	8.136	3.172	2.077	6.267	7.928
* P-Value<0.10, ** P-Value <0.05, *** P-Value <0.01							

The constant is not reported in the table above

Table C.10.c: CCEMG estimations in diff-log form using the extensive margin index

Specifications using the relative quality index

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	Δln(Quality index)						
Δln(CSCPI)	0.031	-0.030	-0.008	0.008	-0.013	-0.023	-0.021
	(1.029)	(-1.064)	(-0.273)	(0.224)	(-0.467)	(-0.758)	(-0.800)
Δln(REER)	-0.016	-0.008	0.002	-0.062*	-0.035	-0.024	-0.015
	(-0.611)	(-0.307)	(0.049)	(-1.804)	(-1.058)	(-1.114)	(-0.503)
Δln(GFCFshare)	0.023	0.037**	0.008	0.037**	0.024	0.021	0.021
	(1.159)	(2.454)	(0.496)	(2.067)	(1.517)	(1.100)	(1.261)
Δln(School)	-0.015	-0.010	0.027	0.008	-0.001	-0.021	0.004
	(-0.318)	(-0.208)	(0.697)	(0.251)	(-0.024)	(-0.463)	(0.111)
Δvol(CSCPI)	-0.004						
	(-1.435)						
Δln(Pop active)		-0.128					
		(-0.248)					
$\Delta\ln(\frac{M}{GDP})$			0.024				
			(1.141)				
Δln(Financial dev)				-0.000			
				(-0.009)			
ΔCapital open					0.005		
					(0.232)		
ΔDemocracy level						-0.016	
						(-0.594)	
Δln(PPP GDP pc)							0.018
							(0.343)
N	1565	1562	1565	1270	1421	1508	1501
N of countries	65	65	65	58	63	64	63
Wald Chi²	4.934	7.356	2.111	7.641	3.695	3.594	2.614
* P-Value<0.10, ** P-Value <0.05, *** P-Value <0.01							

The constant is not reported in the table above

Table C.10.d: CCEMG estimations in diff-log form using the relative quality index

Specifications using the manufacturing VA share

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	Δln(Manu share)						
Δln(CSCPI)	-0.005	-0.012	0.015	-0.021	-0.059	-0.076*	0.017
	(-0.097)	(-0.292)	(0.393)	(-0.375)	(-0.967)	(-1.721)	(0.413)
Δln(REER)	-0.183***	-0.195***	-0.141***	-0.095	-0.091	-0.109**	-0.191***
	(-3.613)	(-4.162)	(-3.075)	(-1.412)	(-1.408)	(-2.131)	(-3.332)
Δln(GFCFshare)	0.073**	0.060**	0.024	0.048*	0.092***	0.056*	0.057**
	(2.377)	(2.220)	(0.762)	(1.708)	(3.008)	(1.707)	(1.994)
Δln(School)	0.001	0.012	0.066	-0.063	-0.005	0.017	0.007
	(0.013)	(0.172)	(1.004)	(-0.729)	(-0.060)	(0.228)	(0.083)
Δvol(CSCPI)	-0.004						
	(-0.625)						
Δln(Pop active)		-0.633					
		(-1.047)					
$\Delta\ln(\frac{M}{GDP})$			0.021				
			(0.537)				
Δln(Financial dev)				-0.018			
				(-0.548)			
ΔCapital open					0.006		
					(0.152)		
ΔDemocracy level						0.014	
						(0.586)	
Δln(PPP GDP pc)							-0.230***
							(-2.619)
N	1816	1813	1816	1460	1591	1707	1694
N of countries	72	72	72	65	69	69	69
Wald Chi²	19.106	23.461	11.485	5.887	11.992	10.809	22.113
* P-Value<0.10, ** P-Value <0.05, *** P-Value <0.01							

The constant is not reported in the table above

Table C.10.e: CCEMG estimations in diff-log form using the manufacturing VA share

3.6.3. CCEMG estimations with the lagged log form of the dependent variable

Specifications using the concentration index

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	Δln(Conc index)						
$\ln(\text{Conc index})_{t-1}$	-0.520***	-0.651***	-0.575***	-0.645***	-0.593***	-0.598***	-0.591***
	(-9.836)	(-13.320)	(-12.106)	(-12.463)	(-11.996)	(-12.772)	(-12.417)
Δln(CSCPI)	0.064***	0.049***	0.073***	0.068***	0.060***	0.058***	0.064***
	(3.163)	(2.804)	(4.436)	(2.877)	(3.059)	(3.346)	(4.138)
Δln(REER)	0.025*	0.032**	0.015	0.019	0.018	0.014	0.023
	(1.858)	(2.469)	(1.183)	(1.125)	(1.604)	(1.139)	(1.637)
Δln(GFCFshare)	-0.012	-0.013	-0.002	-0.020*	-0.026**	-0.009	-0.017*
	(-1.187)	(-1.511)	(-0.185)	(-1.764)	(-2.566)	(-0.812)	(-1.730)
Δln(School)	-0.060**	-0.067**	-0.062**	-0.104***	-0.091***	-0.078***	-0.059**
	(-2.415)	(-2.183)	(-2.355)	(-3.203)	(-2.966)	(-2.798)	(-2.172)
Δvol(CSCPI)	0.001						
	(0.427)						
Δln(Pop active)		-0.062					
		(-1.227)					
$\Delta\ln(\frac{M}{GDP})$			-0.007				
			(-0.408)				
Δln(Financial dev)				0.020**			
				(2.509)			
ΔCapital open					0.025		
					(1.003)		
ΔDemocracy level						-0.002	
						(-0.138)	
Δln(PPP GDP pc)							0.031
							(1.357)
N	2386	2383	2386	2002	2190	2310	2272
N of countries	72	72	72	69	72	71	72
Wald Chi²	117.619	199.932	173.384	184.520	172.232	184.113	183.532
* P-Value<0.10, ** P-Value <0.05, *** P-Value <0.01							

The constant is not reported in the table above

Table C.11.a: CCEMG estimations with the lagged log form of the dependent variable using the concentration index

Specifications using the intensive margin index

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	Δln(Int margin)						
$\ln(\text{Int margin})_{t-1}$	-0.517***	-0.678***	-0.566***	-0.625***	-0.590***	-0.627***	-0.604***
	(-11.635)	(-15.709)	(-12.554)	(-12.415)	(-13.533)	(-15.372)	(-12.897)
Δln(CSCPI)	0.049**	0.059***	0.057***	0.068***	0.081***	0.061***	0.058***
	(2.470)	(3.112)	(2.904)	(3.142)	(4.141)	(3.584)	(3.352)
Δln(REER)	0.021	0.024	0.026	0.023	0.008	0.010	0.023
	(1.252)	(1.392)	(1.403)	(1.116)	(0.586)	(0.749)	(1.416)
ln(GFCFshare)	-0.026**	-0.016	-0.016	-0.004	-0.015	-0.005	-0.021*
	(-2.524)	(-1.348)	(-1.173)	(-0.279)	(-1.165)	(-0.426)	(-1.652)
ln(School)	-0.037	-0.018	0.015	-0.029	-0.042	-0.043	-0.017
	(-1.492)	(-0.476)	(0.464)	(-0.911)	(-1.216)	(-1.224)	(-0.543)
vol(CSCPI)	-0.002						
	(-0.819)						
ln(Pop active)		-0.011					
		(-0.145)					
$\ln(\frac{M}{GDP})$			-0.004				
			(-0.171)				
ln(Financial dev)				0.017**			
				(1.964)			
Capital open					0.049*		
					(1.713)		
Democracy level						0.003	
						(0.157)	
ln(PPP GDP pc)							0.066**
							(2.078)
N	2386	2383	2386	2002	2190	2310	2272
N of countries	72	72	72	69	72	71	72
Wald Chi²	152.315	260.458	169.623	170.012	206.398	251.410	186.920
* P-Value<0.10, ** P-Value <0.05, *** P-Value <0.01							

The constant is not reported in the table above

Table C.11.b: CCEMG estimations with the lagged log form of the dependent variable using the intensive margin index

Specifications using the extensive margin index

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	Δln(Ext margin)						
$\ln(\text{Ext margin})_{t-1}$	-0.615***	-0.748***	-0.686***	-0.706***	-0.708***	-0.714***	-0.706***
	(-13.088)	(-15.116)	(-14.639)	(-13.029)	(-13.856)	(-15.272)	(-13.551)
Δln(CSCPI)	0.039	0.020	0.078	0.103	0.045	0.033	-0.017
	(0.652)	(0.350)	(1.429)	(1.509)	(0.911)	(0.755)	(-0.296)
Δln(REER)	0.016	-0.006	0.037	-0.083	-0.011	0.007	-0.051
	(0.402)	(-0.124)	(0.676)	(-1.386)	(-0.173)	(0.146)	(-0.829)
ln(GFCFshare)	-0.020	0.011	-0.013	-0.059	-0.033	-0.011	0.010
	(-0.521)	(0.383)	(-0.354)	(-1.139)	(-0.900)	(-0.254)	(0.256)
ln(School)	-0.075	-0.132	-0.113	-0.096	-0.128	-0.159	-0.090
	(-0.769)	(-1.255)	(-1.133)	(-0.912)	(-1.570)	(-1.462)	(-1.144)
vol(CSCPI)	-0.020						
	(-1.412)						
ln(Pop active)		-0.386*					
		(-1.956)					
$\ln(\frac{M}{GDP})$			-0.067				
			(-1.268)				
ln(Financial dev)				-0.007			
				(-0.212)			
Capital open					0.032		
					(0.609)		
Democracy level						0.013	
						(0.191)	
ln(PPP GDP pc)							0.057
							(0.584)
N	2317	2314	2317	1958	2135	2244	2210
N of countries	72	72	72	68	72	71	72
Wald Chi²	174.744	234.173	219.812	176.119	196.489	236.069	186.118
* P-Value<0.10, ** P-Value <0.05, *** P-Value <0.01							

The constant is not reported in the table above

Table C.11.c: CCEMG estimations with the lagged log form of the dependent variable using the extensive margin index

Specifications using the relative quality index

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	Δln(Quality index)						
ln(Quality index)$_{t-1}$	-0.564***	-0.650***	-0.599***	-0.691***	-0.602***	-0.655***	-0.680***
	(-12.746)	(-13.881)	(-13.204)	(-12.563)	(-12.520)	(-12.812)	(-12.485)
Δln(CSCPI)	-0.022	-0.022	0.000	-0.014	-0.007	0.003	-0.002
	(-1.234)	(-1.373)	(0.008)	(-0.689)	(-0.408)	(0.164)	(-0.069)
Δln(REER)	-0.014	0.006	-0.001	-0.008	-0.007	0.005	0.011
	(-1.024)	(0.369)	(-0.071)	(-0.475)	(-0.468)	(0.379)	(0.807)
ln(GFCFshare)	0.001	0.004	0.003	0.012	-0.007	0.004	-0.013
	(0.133)	(0.458)	(0.239)	(0.857)	(-0.684)	(0.395)	(-1.261)
ln(School)	-0.001	-0.010	-0.012	-0.016	0.008	0.001	0.003
	(-0.049)	(-0.308)	(-0.359)	(-0.413)	(0.306)	(0.045)	(0.109)
vol(CSCPI)	0.004						
	(1.405)						
ln(Pop active)		0.018					
		(0.248)					
ln($\frac{M}{GDP}$)			0.005				
			(0.359)				
ln(Financial dev)				0.014			
				(1.265)			
Capital open					0.003		
					(0.112)		
Democracy level						0.017	
						(1.225)	
ln(PPP GDP pc)							0.010
							(0.300)
N	2279	2276	2279	1902	2106	2204	2192
N of countries	72	72	72	69	72	71	72
Wald Chi²	167.029	195.071	174.658	161.038	157.716	165.988	158.219
* P-Value<0.10, ** P-Value <0.05, *** P-Value <0.01							

The constant is not reported in the table above

Table C.11.d: CCEMG estimations with the lagged log form of the dependent variable using the relative quality index

Specifications using the manufacturing VA share

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	Δln(Manu share)						
ln(Manu share)$_{t-1}$	-0.445***	-0.522***	-0.489***	-0.560***	-0.464***	-0.519***	-0.529***
	(-13.062)	(-15.357)	(-14.592)	(-13.379)	(-12.178)	(-15.570)	(-13.671)
Δln(CSCPI)	-0.051	-0.035	-0.031	-0.044	-0.016	-0.060*	-0.037
	(-1.569)	(-1.252)	(-0.847)	(-1.085)	(-0.357)	(-1.767)	(-1.008)
Δln(REER)	-0.054**	-0.065**	-0.060**	-0.082**	-0.135***	-0.066**	-0.061**
	(-2.159)	(-2.231)	(-2.038)	(-1.973)	(-3.237)	(-2.312)	(-2.026)
ln(GFCFshare)	-0.018	-0.010	-0.010	-0.018	-0.009	-0.007	0.008
	(-0.827)	(-0.488)	(-0.358)	(-0.694)	(-0.321)	(-0.333)	(0.264)
ln(School)	0.020	0.019	-0.023	0.019	0.046	0.022	0.009
	(0.508)	(0.291)	(-0.517)	(0.294)	(0.791)	(0.431)	(0.209)
vol(CSCPI)	-0.004						
	(-0.724)						
ln(Pop active)		-0.018					
		(-0.128)					
ln($\frac{M}{GDP}$)			0.044				
			(1.333)				
ln(Financial dev)				0.015			
				(0.705)			
Capital open					-0.003		
					(-0.099)		
Democracy level						0.017	
						(0.630)	
ln(PPP GDP pc)							-0.010
							(-0.146)
N	2601	2598	2601	2146	2327	2476	2461
N of countries	76	76	76	73	75	74	76
Wald Chi²	179.220	242.712	219.966	185.128	159.644	251.603	192.158
* P-Value<0.10, ** P-Value <0.05, *** P-Value <0.01							

The constant is not reported in the table above

Table C.11.e: CCEMG estimations with the lagged log form of the dependent variable using the manufacturing VA share

3.6.4. CCEMG estimations without small countries

We exclude from the sample countries with an average population over the sample below 1 million inhabitants so that we exclude Iceland, Guyana, Suriname, Bahrain, Bhutan, Equatorial Guinea, and Solomon Islands.

	(1)	(2)	(3)	(4)	(5)
	Δln(Conc index)	Δln(Int margin)	Δln(Ext margin)	Δln(Quality index)	Δln(Manu share)
Δln(CSCPI)	0.142***	0.120***	0.130*	-0.027	-0.054*
	(5.429)	(3.796)	(1.699)	(-1.302)	(-1.772)
Δln(REER)	0.045***	0.057***	-0.040	-0.016	-0.043
	(3.083)	(3.315)	(-0.841)	(-1.155)	(-1.292)
ln(GFCFshare)	-0.015*	-0.016**	0.005	0.013	-0.006
	(-1.852)	(-2.250)	(0.119)	(1.622)	(-0.346)
ln(School)	-0.024**	0.012	-0.171***	-0.013	0.034
	(-2.034)	(0.791)	(-2.722)	(-1.003)	(1.093)
vol(CSCPI)	-0.004	-0.006	-0.024	0.004	-0.003
	(-1.357)	(-1.463)	(-1.618)	(1.372)	(-0.378)
N	2125	2125	2097	2035	2302
N of countries	65	65	65	65	68
Wald Chi²	48.386	33.226	13.638	8.548	6.266
* P-Value<0.10, ** P-Value <0.05, *** P-Value <0.01					

The constant is not reported in the table above

Table C.12: CCEMG estimations without small countries

3.6.5. CCEMG estimations without countries from the OPEC

We exclude countries who have been for at least 10 years during our time period members of the Organization of the Petroleum Exporting Countries (OPEC) which includes every current member (Algeria, Ecuador, Indonesia, Iran, Iraq, Kuwait, Libya, Nigeria, Qatar, Saudi Arabia, United Arab Emirates, and Venezuela) apart from Angola which has joined the organization in 2007, as well as Gabon which was a former member from 1975 to 1994.

	(1)	(2)	(3)	(4)	(5)
	Δln(Conc index)	Δln(Int margin)	Δln(Ext margin)	Δln(Quality index)	Δln(Manu share)
Δln(CSCPI)	0.130***	0.106***	0.194*	-0.022	0.012
	(4.848)	(3.581)	(1.776)	(-0.919)	(0.374)
Δln(REER)	0.033**	0.051**	-0.122*	-0.010	-0.083**
	(2.055)	(1.970)	(-1.701)	(-0.615)	(-2.051)
ln(GFCFshare)	-0.013	-0.008	0.001	0.001	0.003
	(-1.569)	(-0.718)	(0.011)	(0.079)	(0.168)
ln(School)	-0.023	0.035*	-0.245**	-0.005	-0.017
	(-1.261)	(1.726)	(-2.416)	(-0.428)	(-0.582)
vol(CSCPI)	-0.005*	-0.007	-0.014	0.005	-0.001
	(-1.803)	(-1.499)	(-0.778)	(0.997)	(-0.142)
N	1925	1925	1856	1893	2130
N of countries	59	59	59	60	63
Wald Chi²	35.027	22.444	12.488	2.407	4.734
* P-Value<0.10, ** P-Value <0.05, *** P-Value <0.01					

The constant is not reported in the table above

Table C.13: CCEMG estimations without countries from the OPEC

3.6.6. CCEMG estimations with alternative REER variables

As explained in appendix 5, we have computed two others REER series so we will check the sensitivity of our results to the change of our REER variable. The first table uses the REER based on the GDP deflator from the WEO instead of the PWT 8.0., while the second table uses REER computed with CPI from the WEO.

Specifications using the REER computed thanks to the GDP deflator from the WEO

	(1)	(2)	(3)	(4)	(5)
	Δln(Conc index)	Δln(Int margin)	Δln(Ext margin)	Δln(Quality index)	Δln(Manu share)
Δln(CSCPI)	0.109***	0.100***	0.258***	-0.017	-0.043
	(4.670)	(4.300)	(3.221)	(-0.882)	(-1.039)
Δln(REER)	0.015	0.041**	-0.096	-0.020	-0.063*
	(1.153)	(1.975)	(-1.047)	(-1.254)	(-1.797)
ln(GFCFshare)	-0.011	-0.007	-0.004	0.023***	-0.038
	(-1.576)	(-0.943)	(-0.106)	(2.820)	(-1.628)
ln(School)	-0.017	0.018	-0.203***	-0.005	-0.002
	(-1.350)	(1.096)	(-2.899)	(-0.435)	(-0.060)
vol(CSCPI)	-0.002	-0.006**	-0.000	0.002	-0.002
	(-1.308)	(-2.145)	(-0.019)	(0.656)	(-0.282)
N	2223	2223	2161	2144	2411
N of countries	70	70	70	70	75
Wald Chi²	29.152	29.086	19.882	10.922	7.039
* P-Value<0.10, ** P-Value <0.05, *** P-Value <0.01					

The constant is not reported in the table above

Table C.14.a: CCEMG estimations using the REER computed thanks to the GDP deflator from the WEO

Specifications using the REER computed thanks to the CPI from the WEO

	(1)	(2)	(3)	(4)	(5)
	Δln(Conc index)	Δln(Int margin)	Δln(Ext margin)	Δln(Quality index)	Δln(Manu share)
Δln(CSCPI)	0.125***	0.114***	0.204**	-0.013	-0.049
	(5.629)	(4.581)	(2.457)	(-0.706)	(-1.192)
Δln(REER)	0.004	0.011	-0.108	-0.025	0.001
	(0.246)	(0.519)	(-1.116)	(-1.552)	(0.029)
ln(GFCFshare)	-0.010	-0.006	-0.019	0.019*	-0.010
	(-1.252)	(-0.662)	(-0.493)	(1.883)	(-0.426)
ln(School)	-0.010	0.011	-0.221***	-0.022*	-0.019
	(-0.895)	(0.843)	(-2.636)	(-1.785)	(-0.653)
vol(CSCPI)	-0.003*	-0.006**	-0.002	0.007*	-0.002
	(-1.944)	(-2.300)	(-0.115)	(1.756)	(-0.256)
N	2203	2203	2141	2124	2394
N of countries	70	70	70	70	75
Wald Chi²	37.891	27.694	14.488	12.721	2.094
* P-Value<0.10, ** P-Value <0.05, *** P-Value <0.01					

The constant is not reported in the table above

Table C.14.b: CCEMG estimations using the REER computed thanks to the CPI from the WEO

4. Sovereign Wealth Funds as Part of a Country Macroeconomic Strategy: Special Focus on Resource dependent Economies

Sovereign Wealth Funds have attracted a lot of attention over the past decades. In the years following the global economic crisis there was a context of emerging countries reserve accumulation and economic catch-up. In addition to the overall increase of commodity prices over the 2000s, this motivated countries to gather part of the national wealth in funds, a tradition which started in the second half of the last century.

However, it has not always been clear so far how to define those funds, with people referring to them as Sovereign Wealth Funds, Natural Resource Funds, Extrabudgetary Funds, Reserve Accounts at the Central Bank, or funds defined by their objective (pension, stabilization, future generation…).

While "Sovereign Wealth Funds" has been the most trending name to define them, it shows the blurred overview of these funds. In fact, a lot of definitions has been proposed for Sovereign Wealth Funds which often reflects the authors own perspective.

Following the global economic crisis, Sovereign Wealth Funds provided an alternative source of funding in developed economies. However, there has been a worry regarding the opacity of these funds because a lot of them have been ruled by autocratic regimes which could seek strategic geopolitical interests.

As a result, the IMF inspired an International Working Group on Sovereign Wealth Funds to fix some Generally Accepted Principles and Practices regarding the transparency and governance of these structures. It resulted in the Santiago Principles which have been the benchmark to define Sovereign Wealth Funds as well as for fund management.

Most analyses have been realized from the investment receiving countries perceptive with few authors focusing on origin countries perspective. In fact, Megginson and Fotak (2015) provide a comprehensive survey on the literature regarding Sovereign Wealth Funds and acknowledge the lack of studies from the point of view of the countries which set up the funds especially regarding their benefits for the population and various economic challenges those countries face. This has partly motivated this study to give some light on the typology of national funds labelled as Sovereign Wealth Funds, and how such funds may help countries to manage their macroeconomic challenges.

To do so, I will present in section 4.1 all the elements surrounding the concept of Sovereign Wealth Funds without restricting the focus to resource dependent economies. This will cover their definitions, the nature of the wealth managed, the motivations to set up such funds, the common categories of Sovereign Wealth Funds, and their suitability. Then, I will provide an extensive discussion on the typology of Sovereign Wealth Funds in section 4.2. It will feature a critical discussion on the concept of Sovereign Wealth Funds, an identification of the challenges for any typology on the subject, before providing a framework to identify funds assimilated as Sovereign Wealth Funds in a continuum of Public Funds.

Even though the first parts of the analysis cover every country irrespective of their development level, or their natural resource dependence, I will provide a focus on Sovereign Wealth Funds in the context or resource dependent economies in section 4.3, what challenges could they overcome and which factors could limit their usefulness.

4.1. What do we know regarding Sovereign Wealth Funds?

4.1.1. Origins of a concept

In response to the rise of wealth accumulation in public pools over the beginning of the century, authors tried to define these pools of assets. This wealth accumulation occurred both in commodity-exporting countries benefiting from bullish prices and in emerging countries with external surpluses[77].

The literature had already studied natural resource funds, mainly oil funds (Fasano, 2000) set to stabilize the budget from commodity price volatility and/or to share resource wealth across generations (Norway, Kuwait). On the other hand, there has been some focus on the implications of reserve accumulation or the investment strategies of reserve assets (Singapour, Malaysia).

Rozanov (2005) first introduced the concept of Sovereign Wealth Funds to define such public funds with heterogeneous profiles.

In 2008, an International Working Group on Sovereign Wealth Funds[78] was created to provide some Generally Accepted Principles and Practices (GAPP) regarding SWFs investments and funds governance frameworks, which resulted in the Santiago Principles (2008) which contain 24 GAPP. On top of that it provides the following definition for SWFs:

"SWFs are defined as special purpose investment funds or arrangements, owned by the general government. Created by the general government for macroeconomic purposes, SWFs hold, manage, or administer assets to achieve financial objectives, and employ a set of investment strategies which include investing in foreign financial assets. The SWFs are commonly established out of Balance of Payments surpluses, official foreign currency operations, the proceeds of privatization, fiscal surpluses, and/or receipts resulting from commodity exports"

Thus, this definition excludes Foreign currency reserve assets held by monetary authorities for the traditional Balance of Payments or monetary policy purposes, operations of state-owned enterprises in the traditional sense, government-employee pension funds, or assets managed for the benefit of individuals. It identifies 4 key elements for the definitions which are ownership (general government), the nature of their investment (foreign financial assets), their purpose (macroeconomic) and objectives (financial objectives).

However, the definition remains blurred even on the level of public ownership of the fund. For instance, the group of funds includes sub-national founds such as the Alaska Permanent Fund or the Alberta Heritage Savings Trust Fund, which belongs to local states and not the general government as was stated by the definition.

The Sovereign Investment Lab (2016) propose an alternative definition for its annual reports on Sovereign Wealth Funds. Even if it maintains the abovementioned elements, it indicates that the Fund should be managed independently of other state financial and political institutions, which eliminates stabilization funds and ultimately other funds managing Sovereign Wealth which are monitored by a government entity.

Both definitions have the drawback to limiting the focus to funds which have a sizable share of their investment which is international, a blurring notion which induces that funds would only matter if they invest abroad. This criterion is a good starting point to analyze funds which matters for international financial stability, investments in foreign equity markets, or to define common rules for cross border investments of Sovereign Wealth Funds. However, it overlooks funds that are key in some countries but do not have major international impact either due to the rarity of their foreign investments, or their small size in comparison with the biggest funds.

[77] These countries are mainly concentrated in East Asia.

[78] The International Working Group on Sovereign Wealth Funds became the International Forum on Sovereign Wealth Funds following the Kuwait Declaration in 2009. As of 2019, it includes 32 members.

The most common source of currently used data on Sovereign Wealth Funds is the list of funds provided by the Sovereign Wealth Funds Institute. However, they include some funds such as stabilization funds which are excluded from the previous definitions. It also accounts for some Strategic Development Sovereign Wealth Funds which would not be included according to the other definitions due to the domestic target of part of their investments.

4.1.2. Where do the wealth originate from?

Sovereign Wealth Funds differ according to the type of sector the wealth comes from. One common pattern consists in identifying on the one hand funds who arise from commodity wealth, especially mining or hydrocarbon products, and on the other hand funds fed by external surpluses. This duality can be justified when we assess or compare different macroeconomic frameworks because of the challenges specific to resource dependent economies[79].

The concept of Sovereign Wealth Funds has been historically linked to the growing importance of oil funds in the years 1980s-1990s and to natural resource wealth management. This first wave of funds may have started with the Kuwait Investment Authority which has been launched in 1953 to manage a General Reserve Fund as well as a Future Generations fund.

However, increasing external surpluses from some industrial economies especially in East Asia during the years 1990s-2000s have triggered the creation of multiple funds managing wealth unrelated to natural resources. This wave of funds has more recently been followed by other fund creations in developed economies more related to future pension management and attracting massive investments in the local economy, which happened in France or Italy for instance.

While a duality between natural resource and non-natural resource wealth origin could prove useful in some regards, it may be an oversimplification of the pattern[80]. In fact, we could argue that what would really matter would be the institutional actor which channel the wealth through the fund instead of the economic sector it comes from.

A first class of actors could be the Minister of Finance and other fiscal policy deciders in case of direct funding from budget surpluses, a pattern especially reliant among budget stabilization funds but not exclusive to them. The identification could prove blurring when a mix of extrabudgetary funds would be involved in this process.

Another main origin of wealth could be excess foreign exchange reserves at the Central Bank which could channel wealth to seemingly independent funds or insulate wealth among one fund or entity within the control of the monetary authority. While it could be tempting to associate East Asian economies to this pattern, we should not forget that it also corresponds to some resource dependent economies such as Saudi Arabia through its foreign holdings at the Saudi Arabian Monetary Authority, the country Central Bank[81].

Private and public companies can also be identified as a third class of actors. Especially in the case of natural wealth production, key extractive companies could pay directly royalties to the fund or indirectly through the public budget before coming into the fund. Another kind of companies would be public companies whose portfolio could be managed by a Sovereign Wealth Fund. Those funds can also manage the proceeds of privatization of former public companies.

[79] Section 4 will provide an extensive analysis for resource dependent economies.
[80] Such duality could prove problematic when considering a fund financed from global surplus in an economy dependent on natural resources (Australia, New Zealand).
[81] Saudi Arabian authorities have long contested the denomination of Sovereign Wealth Funds for these holdings even though most practitioners have included it due to more diverse, risky, and long-lasting investments carried out than traditional central bank holdings. It could reflect the officials' trade-off between promoting transparency to facilitate investments and the non-disclosure to enable discretionary actions, which is far from restricted to the Saudi Arabian case.

Beyond the resource and non-resource sector duality and the split between the 3 main classes of entities the wealth come from, we should mention less frequent wealth origins such as land leases (Nunavut Trust, Canada), or lease of satellite space (Tonga Trust Fund).

4.1.3. Motivations for countries to set up Sovereign Wealth Funds

4.1.3.1. Natural resource wealth management

Sovereign Wealth Funds have historically been linked to the idea of natural resource wealth management, be it through splitting rents across generations, insulating the budget from commodity price fluctuations or limiting Dutch Disease pressures.

Due to the exhaustive nature of key commodities such as hydrocarbons or mining products, it is a challenge to insure a satisfying repartition of wealth across generations. While a government could face pressures to spend the current earnings because future generations do not vote, saving wealth during the natural resource wealth exploitation and maximizing its returns through Sovereign Wealth Fund investments could help spreading wealth across time.

A major fiscal concern in natural resource dependent economies consists in protecting the budget from excessive fluctuations through international commodity prices variations. Saving some wealth during commodity price booms to fund the budget in rainy-day situations could be a relevant strategy for this purpose. Sovereign Wealth management could be useful; provided clear deposit, withdrawal and investments rules are defined, while safeguarding this structure from discretionary transactions from officials responsible of fiscal policy.

Behind Sovereign Wealth management, a government could aim at limiting Dutch Disease phenomenon. In fact, extra public spending during commodity price booms could induce extra inflationary pressures, a lack of price competitiveness through real appreciation of the domestic currency, and ultimately a shrinking non-resource sector. This trouble could be especially challenging in small sized economies which would react more to sizable variations of public expenditures while being at the same time more impacted by a loss of price competitiveness due to their exposure to external factors.

4.1.3.2. Domestic economic management

A second class of motivations behind the implementation of a Sovereign Wealth Fund rely on national economic management, would it be through targeting specific spending, promoting strategic investments, maximizing returns on extra reserves as a buffer in case of a currency crisis, or funding future pension needs.

Under a fund's management, some fractions of its wealth could be earmarked for specific area such as infrastructure, health, or education. Especially in case of sizable natural resource wealth, it could provide a signal of concrete outcomes for the population welfare who may inquire about how the money has been used and shared.

Managing foreign holdings through a Sovereign Wealth Fund could be a tool to promote national strategic development through investments in key economic sectors. It could foster the development of activities downstream resource extraction such as hydrocarbon transport or refinery to increase the national value added from the raw natural resource[82]. Another strategy could be to invest in sectors whose economic cycle is negatively correlated with the natural resource price cycle as a mean to diversify the economy and limit the exposure to abrupt economic fluctuations. Investments in the air transportation sector by some oil-rich countries such as Qatar and the

[82] Such motivation could apply for investments in sectors downstream some non-extractive resources such as investments in textile for cotton producers, and the local transformation of cocoa bean, coffee bean, or cashew seeds for instances.

United Arab Emirates illustrate this pattern. Whether or not linked to economic diversification outcomes, foreign investments could help develop the domestic sector through increased expertise or availability of advanced technology.

Following currency crises in Latin America and East Asia during the 1990s, emerging economies relying on a fixed exchange rate have been more inclined to building up reserve buffers in case of threat on the national currency. While the strategy consisting in saving huge pools of reserves for currency interventions could date back to the context of pre-World War II currency war, it could be a motivation behind the management of extra reserves through a Sovereign Wealth Fund. In fact, the set of assets a Central Bank traditionally invests in consists of very liquid financial holdings such as Treasury Bonds which presents less risk at the cost of less potential financial returns. In this regard, it consists in maximizing returns on national wealth beyond the necessary holdings for short term interventions.

A government could also see a Sovereign Wealth Fund as a tool to maximize savings from budget surpluses to fund in the future public pension needs. This topic is especially important in economies with an increasing dependency ratio and an ageing population which would fear the narrowing of the tax base and the increased financial burden in the future.

4.1.3.3. Political economic motivations

Beyond economic motivations, we can't exclude that governments seek political objectives when setting up a Sovereign Wealth Fund.

Due to the opacity of some Sovereign Wealth management, a political leader could see the creation of a Sovereign Wealth Fund as an opportunity to keep aside some wealth away from public scrutiny. This money could ultimately be used for personal goals ranging from personal enrichment, or the fund could even be used as a fund for corruption to bribe the elites or potential voters. Political motivations could also be well intended when trying to limit access of some wealth from the country deciders, thus limiting misappropriation and bribery.

A Sovereign Wealth Fund could be considered as a trendy structure which could signal modernity, financial expertise, and development. In a leader's mind the simple fact of building up such fund could be more important than the fund's stated goals and the challenges it would target. Under such a strategy, the fund could help the political leader to gain domestic or international support.

However, Sovereign Wealth Fuds have mainly attracted a lot of attention from country recipient of their investments due to potential geopolitical motivations. While we can't exclude it may have played some role in specific transactions, the literature supports the economic motives of Sovereign Wealth investments over political ones (Alhashel, 2014).

4.1.4. Main categories of Sovereign Wealth Funds

As discussed previously, we can distinguish funds accordingly to the sector from which the wealth originates which has driven denominations such as oil funds (Fasano, 2000) or natural resource funds (Bauer, 2014). In this section, I present the categories of funds often linked to the concept of Sovereign Wealth Funds depending on their specific goals.

Even though various definitions of Sovereign Wealth Funds induce the inclusion of different categories of funds, we could identify 5 main categories of funds commonly linked with them, Strategic Investment Funds, Sovereign Pension Reserve Funds, Reserve Investment Funds, Funds for Future Generations, and Stabilization Funds[83].

Strategic Investment Funds would be linked to the concept of Development funds because their aim is to invest domestically some wealth without the constraint of providing the best financial returns across potential investments. The notion of development may thus appear in contradiction to financial returns because such funds may target other outcomes than fund wealth maximization, be it through infrastructure or energy provision, regionally targeted expenditures, or investments in strategic sectors. They could also seek strategic investments abroad to provide positive spillovers in the long run for key domestic sectors.

According to Blundell-Wignall et al (2008), Sovereign Pension Reserve Funds are funds established directly by the government and separated from the social security system[84]. Mainly funded through direct fiscal transfers from the government, they are set up to finance public pension expenditures at a specific future date. Meanwhile they will seek higher financial returns through portfolio diversification to maximize the money available for future governments which would face a higher dependency ratio resulting in a higher financial burden from the pension system

Reserve Investment Funds are pools of assets which are commonly funded by excess foreign exchange reserves and invested abroad to earn higher returns than assets held at the Central Bank for monetary policy purposes. Unlike traditional reserve assets, the investments of these funds have a longer maturity, are riskier, while providing higher potential financial returns. This type of fund started to spread out during the 1990s with the rapid accumulation of reserves in East Asian economies coming from industrial growth and sizable external surpluses.

Funds for Future Generations are a kind of setting exclusive to economies depending on exhaustible resource production with the aim to spread out the wealth coming from natural resources across generations. The idea is to save part of the rent during the exploitation of resources and invest the wealth on a diversified portfolio of assets to maximize its financial returns. Ultimately, the fund is expected to provide fiscal transfers to smooth the budget at the time of resource exhaustion.

Finally, Balding (2012) defines a Stabilization Fund as "a government account designed to smooth public expenditures and consumption by setting aside revenue during periods of rapid growth that then could be drawn on during economic contractions"[85]. Fiscal stabilization funds are an institutional unit especially present in resource dependent countries in order to insulate the budget from drastic commodity price fluctuations.

Apart from the differentiated inclusion of stabilization funds and strategic investment funds across authors, Sovereign Wealth Funds can also be classified according to their overall macroeconomic function (stabilization, saving, development[86]). Under such a typology Funds for Future Generations, Reserve Investment Funds, and Sovereign Pension Reserve Fund would appear as Saving Funds because they share the goal of saving and maximizing wealth through potentially long-term investments for future uses.

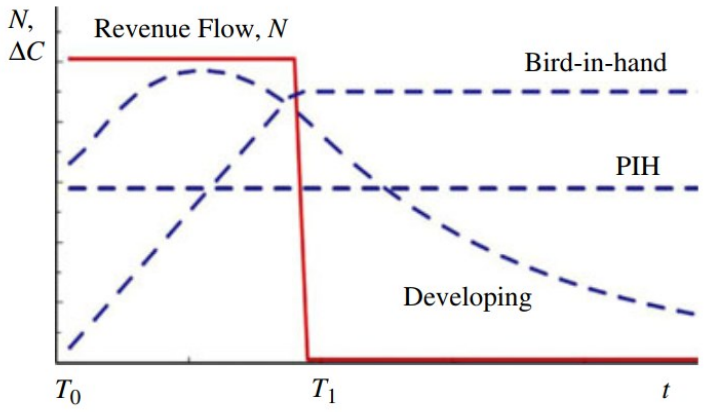
[83] For instance, the Sovereign Wealth Funds Institute distinguishes those 5 types of funds even though they prefer the denomination Strategic Development Sovereign Wealth Funds which mostly corresponds to funds promoting strategic investments with potential domestic development purposes, which I refer to as Strategic Investment Funds.
[84] They distinguish Sovereign Pension Reserve Funds from Social Security Reserve Funds in the scope of Public Pension Reserve Funds.
[85] This highlights the fact that what most authors consider as stabilization funds are fiscal stabilization funds which could be distinguished from monetary stabilization funds as we will discuss latter.
[86] This typology was used in chapter 2.

4.1.5. Are they always worth off?

While setting up funds which could be labelled as Sovereign Wealth Funds has been a trendy strategy of Sovereign Wealth management over the last decades, it may not offer the proper design for every country in the world.

In the resource management literature, there has been a long-lasting debate on when and how to invest or save natural resource wealth. The main policies of resource consumption have been summarized in Figure 4.1 below from Van der Ploeg and Venables (2011). The standard approach has long been the Permanent Income Hypothesis (PIH) which implies that a country maintains constant its consumption equal to the return on the current value of future resource revenues. A variant of the PIH named the Bird-in-hand hypothesis states that only the interests of the saved revenues should be invested before resource depletion (T_1 in figure 1). Both Hypotheses do not take into account capital scarcity in some countries, especially developing countries which would need a higher pace of resource consumption to invest domestically due to the higher returns on investments domestically than on the international financial markets.

However, the Permanent Income Hypothesis has long been regarded as the main hypothesis behind the management of a Sovereign Wealth Fund because the first wave of funds creation in the 20th century arose from developed countries (Alberta, Alaska, Norway) in which the PIH would apply, or at least their setting-up was influenced by economists from developed economies (Chile).



Source: Van der Ploeg and Venables (2011)

Figure 4.1: Resource consumption under different policy rules

Further criticisms arose when African countries considered setting some Sovereign Wealth Funds especially due to huge potential returns on investment in key sectors such as infrastructure, energy provision, health, or education; compared with potential financial returns on international markets (Amoako-Tuffour, 2016)[87].

Besides, the implementation of a fund could prove challenging when it involves holding national assets because it bypasses normal budgetary procedures, thus undermining fiscal management. This could be especially damaging in countries in which the fiscal administration lacks the capacities to monitor and manage complex macroeconomic frameworks.

[87] We should note that some countries may lack some investment capacities such as engineers, doctors, teachers and so on; which may limit the effectiveness of investment in some cases.

Parliamentary accountability could also be altered when the government enables domestic investments through the fund's spending's decisions rather than through the budget process. It could be a problem to ensure the proper transparency of resource revenue management and may feed social unrest.

A joint report from the Natural Resource Governance Institute and the Columbia Center on Sustainable Investment (Bauer, 2014) identify six recommendations for Natural Resource Funds governance which could be extended to overall Sovereign Wealth management. They include clarifying the fund's objectives, establishing clear fiscal rules relative to deposit and withdrawal, setting investment rules, defining a division of responsibilities across owner and managers, requirement of key information disclosure, and the presence of a strong oversight body.

4.2. Typology of Sovereign Wealth Funds

4.2.1. Which funds could be defined as Sovereign Wealth Funds?

It is difficult to delimit Sovereign Wealth Funds in the continuum of public funds that manage sovereign wealth. As such, we can see Sovereign Wealth Funds as one kind of extrabudgetary funds with purposes which could overlap with other public funds[88].

When thinking about Sovereign Wealth management, we should wonder whether it is independent from the budgetary and or monetary authorities. When the fund is expected to carry out spending, there is a trade-off regarding the independence of the structure. Independence could be a desirable outcome when the fiscal or monetary authorities could favor their own objectives before the fund's ones. For instance, a fund under the supervision of the budgetary authority could be used for fiscal spending not in accordance with an intergenerational equity objective to provide extra public spending right now. In the same way, funds managed under the Central Bank control could be used by the monetary authority to achieve monetary objectives like inflation targeting or exchange rate management instead of the funds' original purposes.

However, we could point that including the fund into the macro-management framework of a country could help achieve macroeconomic objectives instead of diverting resources and control. Another point concerns the lack of skilled human capital to manage public funds and national wealth. In countries lacking the appropriate number of skilled staffs, managing a fund independently could induce a diversion of human resources and mismanagement.

When thinking about Sovereign Wealth Funds, we may wonder what the Sovereign consists of. In fact, funds often qualifying as Sovereign Wealth Funds belong either to the sovereign nation or to local states within sovereign nations[89].

There is not a clear-cut approach regarding this point. Some authors posit that the fund should belong to a sovereign nation to be considered as a Sovereign Wealth Fund while others do not discriminate. The inclusion of major funds such as the Alaska Permanent Fund, the Abu Dhabi Investment Authority, or the Alberta Savings Trust Fund as members of the International Forum of Sovereign Wealth Funds illustrate this point.

In the case of the Alaska Permanent Fund, we can go further and question whether the fund is a People's Fund more than a Sovereign Fund. In fact, the fund is often seen as a tool belonging to the people of Alaska and has distributed some earnings directly to Alaskans over time.

[88] Radev and Allen (2010) provide an overview of the different extrabudgetary funds and their objectives.
[89] We can think about funds in Canada, the United States, or in the United Arab Emirates as examples.

Another element we should talk about concerns the criterion regarding the extraterritoriality of a significant share of a funds' investment.

This criterion is not straightforward because it is difficult to track whether funds effectively invest abroad and in which proportion. On top of that, foreign investments reflect a fund strategy which could evolve over time. In fact, Singapore's Temasek Holdings was first set to hold and manage investments and assets previously held by the Singapore Government, and only started investing abroad around the beginning of the century.

However, it is not clear which kind of investment is referred as a foreign investment. Some funds with a passive Strategic Asset Allocation favoring liquidity over returns, such as stabilization funds, could invest in liquid foreign assets such as foreign government bonds instead of foreign equity. Because Sovereign Wealth Funds are identified as major investors in the equity market we may wonder if the foreign investment criterion also applies to other liquid financial assets.

Investing abroad could present several benefits from the country's perspective. First, it prevents domestic spending which could by-pass the standard fiscal framework. In case of rapid reserve accumulation related to trade surplus or resource windfall, it could prevent quick domestic inflationary pressures related to Dutch disease phenomenon resulting in domestic competitiveness loss and a shrink of the tradable sector size.

Especially for small countries lacking relevant domestic investment projects, investing in foreign assets could be a wise strategy because of higher returns of investment abroad and the risk of feeding misspending and "white elephant" projects domestically.

Irrespective of the country size, investing abroad could also prove to be beneficial when the country lacks the appropriate absorption capacity of domestic investment. In such a situation, the country is better-off saving the wealth by investing abroad while the country focuses on fixing its absorption capacity limitations as discussed previously.

Sovereign Wealth Funds are expected to make investments based on financial returns on investment. However, some funds considered as Sovereign Wealth Funds have some developmental objectives which do not aim first at maximizing financial investment returns.

Since we have discussed key elements regarding the definitions of Sovereign Wealth Funds, we may wonder eventually what these funds have in common.

When comparing various definitions of Sovereign Wealth Funds in the literature, Capape and Guerrero Blanco (2014) find on a sample of 30 definitions regarding Sovereign Wealth Funds on 2007-2012 that what they have in common refers only to their nature as investment vehicles (instead of operating firms) and their ownership by a sovereign state as illustrated by Table 4.1 below. Such constate led them to describe Sovereign Wealth Funds has having more layers than an onion.

These different funds seem to prepare a country for a future in which its surpluses may wane due to various factors such as permanent decrease of commodity prices, resource depletion, ageing population, loss of trade competitiveness, or currency crisis.

To define more precisely these funds, other assumptions must be made which could depend a lot on the context or the objectives of one's author.

Feature	Description	% Papers
Investment vehicle	Rather than an operating firm	100%
Ownership	Owned by a state entity	100%
International	Its portfolio includes foreign investments	68%
Liabilities	They do not have explicit pension liabilities	58%
Source of funds	Funded via commodity and non-commodity resources	53%
Risk	Invests above the risk-free asset rate*	42%
Long-term	Pursue long-term investment objectives	42%
Purpose	Belong to some of the 4/5 IMF categories of SWFs	37%
Financial objective	Driven by financial maximization purpose	32%
Sovereign authority	It excludes sub-national governments	16%
Independent structure	Managed separately from monetary authorities	16%

Source: Authors' analysis of SWF definitions. *Considering U.S. Treasuries as the risk-free asset benchmark.

Source: Capape and Guerrero Blanco (2014)

Table 4.1: Common features in the definitions of Sovereign

4.2.2. Challenges for any typology on Sovereign Wealth Funds

4.2.2.1. A dynamic concept

When looking at Sovereign Wealth funds in a historical fashion, we should consider the fact that they are not static entities which have always operated the way they do in the present. It is a common bias in Sovereign Wealth Funds studies which rely on a photography of funds at one point in time. Even though it is difficult to operate differently for empiric analysis due to the lack of available information regarding funds history, such strategy could prove problematic for multiple reasons.

Over time funds may change names and or structure with the new ones being related or not to the former entity. This change could limit to the name of the structure which happened for instance in case of Government of Singapore Investment Corporation Private Limited which became GIC Private Limited in 2013 without any other change. Conversely, a change of name can induce a change of the funds objectives which happened in the case of Iran which switched from the Oil Stabilization Fund to the National Development Fund of Iran in 2011.

Conversely, a fund can change its strategies and objectives over time whether or not changing its official mandates. It has been the case for Singapore and Hong Kong funds which first aimed at investing domestically but slowly expended their investment horizon with the fund growth.

As such, changes of names do not always come with a change of objectives while changes of mandates do not always coincide with changes of names and/or structures.

Another major challenge consists in identifying the proper date for the creation of a Sovereign Wealth Fund. This information is especially important for studies relying on the seniority of the fund as a proxy of experience of fund's managers and practices. More often this point will matter to identify the proper time period under which the fund would be considered operational and would have potentially affected macroeconomic outcomes.

The information is not always straightforward and multiple arbitrary decisions should be made due to the lack of comprehensive available information. Regarding the creation of a fund, a law or status declaration may have been produced but it doesn't imply an operational fund the following day. However, it is the most consistent available

feature among Sovereign Wealth Funds even though real operational years would be optimal. This explains why creation dates vary between any list of funds due to various assumptions or subjective appreciation of each fund's history.

The number of funds may vary over time for a single country due to the setting up of new ones or the divide of former funds in multiple entities.

Finally, a static analysis gets rid of former funds which may include depleted funds or funds which didn't prove to be useful anymore. It would bias any empirical assessment picking only Sovereign Wealth Funds which managed to operate until today while removing potential failures.

4.2.2.2. Collecting data on Sovereign Wealth Funds

As evidenced by previous sections, it is not always straightforward to distinguish Sovereign Wealth Funds from other investment funds.

This motivated a review of funds often considered as Sovereign Wealth Funds to determine when possible to which category of investment funds they belong.

To do so, I gathered extensive information on funds that are considered as Sovereign Wealth Funds among several studies, complementing the information with country-specific researches in international institutions documentations, funds or governments website, and some law texts. This first part is not straightforward because authors may refer to the same fund under different denominations[90], different operation periods, and with different objectives.

As covered previously, it may be difficult to insulate funds objectives. Some countries may be reluctant to clarify the fund's objectives while other funds may change their missions over time[91]. Besides, a government or the entity managing the fund may not have the incentives to be transparent regarding the real objectives and management of the fund.

It may not be obvious to identify the correct structure because we could mix up between the fund, the entity managing the fund, and sometimes investment entities or Sovereign Wealth Enterprises responsible for the funds' investments. This point is important to identify the proper age of the fund because different interlinked structures could have different histories. In this regard, a fund could have been managed by different entities over time or different funds could have been managed by the same entity[92].

Another challenge consists in identifying the relevant changes of these funds. Some funds may change the name of their fund over time without significant changes in the fund structure or missions. However, some new set-up funds may replace older funds with different objectives[93].

While the original purpose of this paper was to classify over time every fund with its functions, I tried to identify some funds that would illustrate these challenges and provide some overview on Sovereign Wealth Funds classifications.

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[90] There is often a confusion between the name of the entity which manages the fund and the name of the fund itself, each of which could have its own history and operation periods. For instance, the Gabonese Strategic Investment Fund created in 2012 manages the Sovereign Fund of the Gabonese Republic (former Fund for Future Generations) which was set up in 1998.

[91] For instance, Singapore's Temasek first managed domestic assets from the government before expanding its role to foreign investments management.

[92] Some entities managing sovereign wealth could also manage other funds unrelated to the Sovereign Wealth framework.

[93] In February 2008, former Russian Oil Stabilization Fund has been replaced by the Reserve Fund (a stabilization fund on natural gas and oil government earnings) and the National Wealth Fund (a fund who aimed at supporting the pension system of the Russian Federation).

4.2.3. Identifying Sovereign Wealth Funds in a continuum of public funds

We have seen that funds qualifying as Sovereign Wealth Funds could take changing and overlapping forms which makes them difficult to pick up. In fact, a couple of public funds could be considered close or identical to some Sovereign Wealth Funds.

To illustrate this, I present a framework in Figure 4.2 illustrating the interdependences between various institutional actors managing wealth which could be mixed up with the main categories of Sovereign Wealth Funds discussed in section 4.1.4.

Let's divide the public sector in charge of managing sovereign wealth between a budgetary and a monetary authority from which the wealth could come from. The budgetary authority could be represented by the Finance Department while the monetary authority would correspond to the Central Bank. For the sake of clarity, I do not represent public companies because they could channel wealth through multiple funds within the control of the budgetary authority or in rare situations directly to funds managed at the Central Bank.

In the center of the framework I represent 6 main categories of Sovereign Wealth Funds. It includes the 5 most common kinds of Sovereign Wealth Funds, namely Sovereign Pension Reserve Funds, Funds for Future Generations, Reserve Investment Funds[94], Strategic Investment Funds, and Stabilization Funds. I have split the former concept between Fiscal Stabilization Funds and Monetary Stabilization Funds to clarify the denomination and consider the exchange rate stability funds set up to manipulate exchange rates or provide a buffer against excessive exchange rate variations and exchange rate crisis as Monetary Stabilization Funds.

The arrows in the graphic illustrates the standard evolutions of these funds (i.e. from a Future Generations Fund to a Present Generations Fund) and the interdependences between them which may blur the distinction between structures (i.e. between a Strategic Investment Fund and a Public Development Bank). As such, when assessing the role of a fund associated with sovereign wealth management, we may wonder whether this fund could potentially be mixed up with other kinds of funds[95].

As a result, I would describe each Sovereign Wealth Fund in a continuum of public funds with various dependence level from the budgetary and monetary authorities.

[94] In some typologies, the first three kinds of funds would be gathered in a Saving funds category because they share the goal of managing Sovereign savings but for different objectives. While it would not be problematic to do so to cover some macroeconomic challenges, I have chosen to detail them because the class of actors which could mix up with them would differ.
[95] Depending of each fund's status and operational activities, it could be associated with one of the funds identified on this figure or at various stages between them along arrows. Due to the dynamic nature of Sovereign Wealth Funds discussed previously, they may move along the figure over time reflecting changes of structures, mandates, or operational strategies.

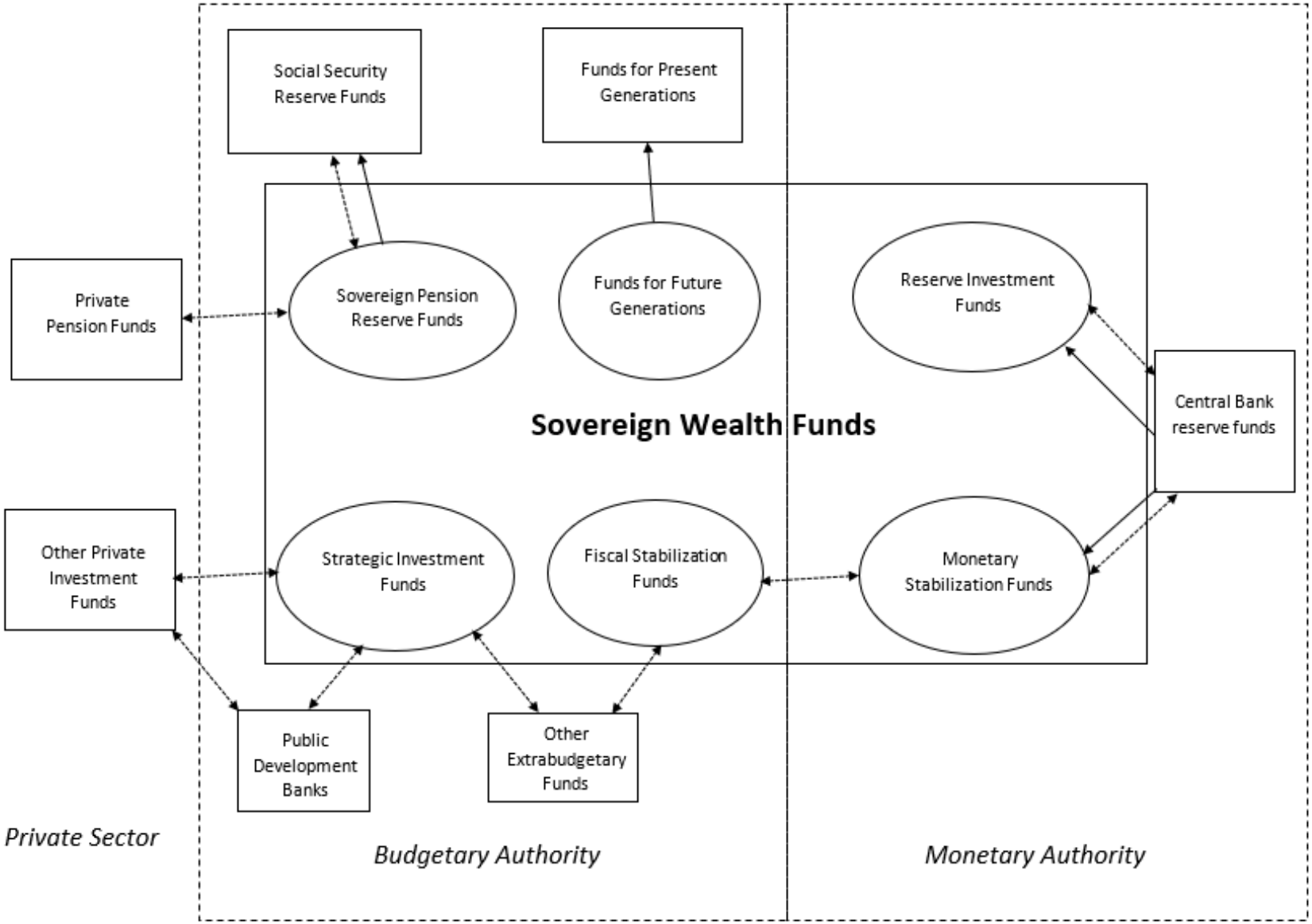

Figure 4.2: Sovereign Wealth Funds in a continuum of public funds

4.2.3.1. Sovereign Pension Reserve Funds

Among institutional schemes with a mandate to finance public pension systems, Sovereign Pension Reserve Funds could be mixed up with other funds.

As discussed previously, Blundell-Wignall et al (2008) suggest a distinction between Sovereign Pension Reserve Funds and Social Security Reserve Funds among Public Pension Reserve Funds. Both structures aim at financing public pension, but the latter is build-in the overall Social Security System while the former is directly established by the government apart from the Social Security System. The flows funding the funds also differ with the Sovereign Pension Reserve Funds being mainly funded through fiscal transfers from the government while Social Security Reserve Funds also include direct employee and employer contributions.

While Sovereign Pension Reserve Funds are treated as Sovereign Wealth Funds due to the lack of present disbursements, there is a lack of clarity on what the status of these funds would become at the time stated for their participation to public pension funding. One possibility would be to convert the fund in some sort of Social Security Reserve Fund inside the Social Security System which would provide direct disbursements. Conversely, the fund could keep its original framework aside from the Social Security System but provide regular transfers to the public budget which could provide transfers to the Social Security System when needed.

Beyond the public scope, Sovereign Pension Reserve Funds could be mixed up with private pension funds due to the myriad of pension funds vehicles at the company level, at sub-national levels, or at various divisions of the public sector. Such distinction could be especially difficult when starting to fund the Social Security System directly or indirectly.

4.2.3.2. Funds for Future Generations

When thinking about Sovereign Wealth Funds in the context of resource dependent economies managing exhaustible resources, the Funds for Future Generations quickly come in mind. As such, saving part of the flow of resource revenue and save it for consumptions of future generations, or carrying out investments whose returns would be felt by those future generations, is a key mechanism of natural resource wealth management.

However, it is not straightforward to identify the status of a fund after resource depletion because the standard definition of Sovereign Wealth Funds implies a current flow of revenues feeding the fund regularly. In fact, such a fund that we could call Fund for Present Generations at this stage, should manage former savings and invest the accumulated wealth. One example of such funds is the Nauru Phosphate Royalties Trust Fund which has been set to save phosphate revenues for future generations and has been progressively depleted with the collapse of phosphate reserves.

Another example is the Alberta Heritage Savings Trust Fund set up in 1976 which had a similar objective of saving oil wealth for future generations. However, the fund still exists even though it has not received resource revenues since 1987. Even though most people still consider the Alberta's fund as a Fund for Future Generation, it may be more a strategic pool of asset that is auto-feeding itself thanks to returns on investments nowadays.

Funds for Future Generations can also be mixed up with the other categories of Sovereign Wealth Funds which happened historically when a fund with a first objective of saving for future generations added other mandates such as stabilizing the budget or saving for future pensions. Due to the nature of the investments for future generations the fund should carry out at some point, the frontier with Strategic Investment Funds could also become narrow depending of the fund's investment decisions.

4.2.3.3. Reserve Investment Funds

Reserve Investment Funds relies on excess reserves held by monetary authorities unlike most Sovereign Wealth Funds funded through resource wealth, even though some cases such as the assets held and managed by the Saudi Arabian Monetary Authority are more an exception than the rule.

It can be difficult to identify a fund from the overall assets held or managed by the Central Bank when the fund is not independent or managed by the Central Bank. It should hold and manage assets with a longer horizon than the Central Bank reserves.

In case of independence from the monetary authorities, a Reserve Investment Fund may act as a strategic investor like Strategic Investment Funds if some of the extra reserves are invested in key economic sectors domestically or internationally.

4.2.3.4. Strategic Investment Funds

Reflecting the worry about the political motivations driving Sovereign Wealth Funds' investments at the time of the global crisis, funds are mostly qualified as Sovereign Wealth Funds when a significant part of their investments are made abroad.

However, domestic investments can represent a significant weight especially when the domestic market provide great returns. Domestic investment is often a criterion of non-selection of Sovereign Wealth Funds analyses even though it is not always clear why such a distinction is made.

Some funds could also act as strategic investors by investing in key foreign industries to promote spillovers for the domestic sector (Bahrain Mumtalakat Holding Company, Qatar Investment Authority) even though a first analysis look could identify such funds as reserve investment funds or future generations funds.

Another strategy of the funds is to act as catalysts for investment in their local economies through agreement with foreign bigger Sovereign Wealth Fund[96], which also questions the criterion of domestic investment regarding Sovereign Wealth Funds analysis.

One main issue concerns the criteria regarding financial returns. In fact, some domestic investment could be part of developmental projects that would provide social benefits, development spillovers, political benefits, instead of pure financial returns. Thus, such funds could bypass the government budget and invest directly in key economic sectors such as energy provision or infrastructures. This

[96] This strategy has been applied for instance by the French Strategic Investment Fund and the Italian Strategic Fund.

way, funds behave similarly to some public development banks such as Brazilian BNDES or State-Owned Enterprises such as Sonangol in Angola.

Due to the complex nature of Sovereign Wealth Vehicles aimed at managing investments of Sovereign Wealth Funds, the distinction between government related Strategic Investment Funds and Private Investment Funds could be blurred.

4.2.3.5. Fiscal Stabilization Funds

The concept of fiscal stabilization funds is clearly defined in the context of natural resource wealth management. When fiscal surpluses exceed a certain benchmark, often related to commodity price outlook, some wealth is saved in the fund while the money will be withdrawn during periods of economic distress.

These funds may use clearly defined deposit and withdrawal rules, often referred as fiscal rules (withdrawal and deposit rules), to clarify the operations of the fund.

More generally, every Sovereign Wealth Fund could act as a de facto stabilization fund because ultimately the wealth belongs to the sovereign state. The global financial crisis of 2008-2009 provides a good example because some countries used their sovereign wealth to provide emergency funding even though the funds were not originally expected to act as fiscal stabilizers[97].

Even though the money didn't come in the budget directly, it substituted itself to government spending needed to face the economic distress.

While covering some historic funds who triggered reserve accumulation in resource dependent countries, stabilization funds are not included in most benchmark definitions of Sovereign Wealth Funds.

One point is to think about the Strategic Asset Allocation of stabilization funds as an allocation favoring liquidity over financial returns to quickly react to changing economic outcomes. It seems to also contradict the part of definitions considering funds as seeking primarily financing returns[98].

4.2.3.6. Monetary Stabilization Funds

However, stabilization funds could be understood as monetary stabilization funds. These ones have a clear aim to keep exchange rate stability and have flourished in response to the beggar-thy-neighbor policies of the 1930s when countries were seeking external competitiveness by depreciating their real exchange rate[99].

[97] Shields and Villafuerte (2010) mention the examples of Russia, Kazakhstan, Qatar, and Kuwait, as countries who used their Sovereign Wealth Funds for domestic support.
[98] An argument could be made that this part of the definition was mainly set to discriminate more among funds targeting geopolitical or developmental objectives over financial ones, especially Strategic Investment Funds.
[99] The United Kingdom set the Exchange Equalization Account in 1934 because of the end of the Gold Standard.

Braunstein (2014) reminds the interactions between currency and fiscal management in the context of commodity price fluctuations. The wide variety of denominations covering these funds reflect such fuzziness[100].

Due to the scope of their mandate, Monetary Stabilization Funds are often managed close to or by the monetary authority which complicates any attempt at delimiting them from other reserves held and managed by the Central Bank.

4.3. Sovereign Wealth Funds and macroeconomic challenges in resource dependent countries

While previous sections may have proved useful in describing the funds linked to the concept of Sovereign Wealth Funds, we now restrict our focus to resource dependent economies. An economy could be considered as resource dependent when its macroeconomic management is dependent on international commodity prices fluctuations[101].

A main part of countries having set up funds linked to the concept of Sovereign Wealth Funds have an economy dependent on natural resource wealth. In these economies, Sovereign Wealth Funds could have been designed to tackle key macroeconomic challenges which would be presented here above.

Due to the importance of the natural resource sector in the sovereign wealth build up, it would involve common challenges specific to these economies we need to consider while thinking about any macroeconomic policy framework.

4.3.1. Macroeconomic challenges

In the following sections I provide a discussion on key macroeconomic challenges faced by resource dependent economies and the way Sovereign Wealth Funds could help tackle them.

4.3.1.1. Dutch Disease

As discussed previously, Dutch Disease is a major challenge facing economies dependent on commodity price swings. In case of a sizable increase of revenues coming from the resource sector, there is a risk of driving inflationary pressures in the economy by overspending which will trigger a

[100] For instance, stabilization funds have been referred to as exchange funds, exchange stabilization funds, rainy day funds, or commodity stabilization funds.
[101] Such a definition may discriminate some resource-rich countries such as China or the United States because their economies are more diversified and are less sensitive to international commodity prices.

real appreciation of the local currency, a loss of price competitiveness of tradable goods and a narrowing of the non-resource tradable sector.

Sovereign Wealth Funds could be helpful to limit appreciation of the local currency by investing abroad some part of the resource windfall. It would limit extra inflationary pressures arising from public overspending during resource booms that would induce real appreciation, a loss of competitiveness of the non-resource tradable sector and a contraction of the non-resource sector.

This is especially important when the country lacks absorption capacities be it due to its small size or to structural factors. In these cases, a country may be better-off saving part of revenues coming from the resource boom in a Sovereign Wealth Fund to spread the use of wealth over time and prevent Dutch Disease phenomenon.

Funds for Future Generations and in some cases Reserve Investment Funds could limit Dutch Disease pressures by saving and investing away from the domestic economy extra wealth while spreading the use of wealth over time and limiting overspending. Fiscal Stabilization Funds could also be considered but it may depend on the exact settings of the fiscal rules and their effectiveness in managing flows of money between the budget and the fund during resource windfalls.

4.3.1.2. Economic diversification

As long as the cash arises from the resource sector, it could be challenging to diversify the non-resource sectors of the economy. This could prove especially important in case of the exploitation of exhaustible resources which won't last forever such as mining products or hydrocarbons. Besides, diversifying the economy could limit its exposure to international commodity fluctuations and improve economic stability.

Sovereign Wealth Funds in general could appear as drivers of economic diversification because they invest in wide range of assets and economic sectors. It can be especially important due to the longer-term horizon and risky nature of their investments than risk-free investments made traditionally by Central Banks when managing foreign reserves.

Funds for Future Generations are explicitly set to channel wealth to generations which will no more benefit directly on the exploitation of the exhausted commodity. To do so, they may maximize the wealth accumulated in the fund through diversified higher-return international investments to maximize the size of future disbursements of the fund in the budget, giving more financial power over time for the fiscal policy to prepare the economy[102].

Strategic Investment Funds may also trigger economic diversification in targeting directly some key investments whose long-term development impact could outclass their short-run financial return. When operating a strategy of foreign investments in key economic sectors, the fund could attract expertise in the sector and provide synergies for the domestic sector. In the same way, foreign investments in sectors downstream the resource sector could help develop these sectors in the long-term in the economy and retain a higher share of the value-added arising from the commodity in the economy.

[102] Such fiscal policy measures could range from infrastructure development, energy provision, educational expenditures, or public subsidies to key non-resource sectors.

4.3.1.3. Financial development

An overlooked aspect of Sovereign Wealth Funds consists in their potential impact on financial development. There has been a discussion for years regarding the detrimental impact of resource wealth on financial development in the resource curse literature.

Even when the status of the fund does not anticipate such use of the wealth, a government could use the money of the fund in case of crisis threatening the domestic banking sector to recapitalize major banking groups, as the Russian government did during the financial crisis of 2008-2009. Even when the money is not used this way, it could be a signal of a potential safety buffer for the domestic banking sector for investors when making their investment decision.

Along the diverse nature of Sovereign Wealth investments, it could ease the development of new economic sectors and provide new opportunities for credit provision and financial market developments.

The management of a Sovereign Wealth Fund may also attract financial experts in the country and develop job opportunities in the financial sector to manage the fund's investments. Such evolution could attract later talents in the financial sector of the economy, develop the financial literacy of the population, and ultimately contribute to financial development.

4.3.1.4. Stabilize the budget from commodity price fluctuations

One of the most common use of Sovereign Wealth management relies on stabilizing the budget from commodity price fluctuations. This objective is mainly operated through a fiscal stabilization fund, a kind of fund which could appear under the Sovereign Wealth Fund definition according to the definition considered.

The efficiency of a fiscal stabilization fund requires to set up clear withdrawal and deposit rules to ensure flows between the fund and the budget react depending on commodity price fluctuations and are not subject to discretionary behaviors of the deciders. Credible and independent forecasts of medium-term commodity prices are key to ensure proper stabilization of the budget as evidenced in the case of Chile (Frankel, 2011).

Beyond price forecasts, the presence of checks and balance from legislative powers as well as oversights by independent structures of the management of the fund are key to ensure the fund operates under its stated mandates.

While such structures may appear as a panacea for fiscal management in resource dependent economies after positive instances in Chile or Norway, some countries may struggle to replicate this success.

In the same way as Fiscal Rules, they may be criticized as too restrictive when putting too much restrictions on potential fiscal responses in case of harsh situations to comply to the stated fiscal framework and maintain fiscal credibility. It also puts a lot of pressure on the forecasters which could have some interests to manipulate the forecasts in the political deciders' interests when they are paid by them.

Due to the importance of transparency, information disclosure, as well as proper checks and balances, it could be more difficult to believe in the credibility of such a setting in countries with an authoritarian tradition or with a poor quality of institutions.

4.3.1.5. Stabilize the local currency in case of Balance of Payments crisis

Due to the international determination of major commodity prices in US dollars, most resource dependent economies are tempted to adopt some kinds of pegged exchange rate regimes with the US dollar to limit fluctuations of the local currency coming from commodity price fluctuations. Such a strategy necessitates a sizable pool of foreign exchange reserves to enable monetary interventions insuring exchange rate stability.

Instead of keeping all assets as classic reserves under the Central Bank management, some countries could be tempted to put extra reserves in a fund managing this wealth to ensure a higher return than on very-liquid risk-free and low return assets classified as reserves at the Central Bank. Provided enough reserves are kept at the Central Bank for precautionary motives, it could increase sovereign wealth and provide more firepower to defend the local currency on the market.

While such function could be clarified in the fund's status as in the case of a monetary stabilization fund, a Sovereign Wealth Fund could be considered as a pool of assets the sovereign entity could also use in last resort when facing a risk of currency crisis[103].

4.3.2. Common limitations to the usefulness of Sovereign Wealth Funds in resource dependent economies

Even though sovereign wealth management through structures linked to the concept of Sovereign Wealth Funds could be promising in helping a country tackle key macroeconomic challenges in resource dependent economies, we may not forget some shortcomings to their build-ups[104].

First, those funds could be tools to target non economically or financial optimal investments. This feature could be especially problematic when investments in the domestic economies would be driven by patronage or insuring investments in key regions to increase future electoral payoffs. A similar limitation could apply for foreign investments when they could be parts of geopolitical strategies to increase power projection abroad or insure diplomatic alliances with key countries.

Building up large pools of assets in countries with a lack of power separation and checks and balances could be risky due to rent seeking behaviors of the rulers which could go as far as complete resource depletion of the fund. During the Libyan Civil War of 2011, Resolutions 1970 and 1973 from the United Nations Security Council resulted in sanctions against the Libyan Investment Authority which used to be ruled out by Muammar Gaddafi's son Saif al-Islam Gaddafi (Behrendt, 2011). This instance illustrates the perception role of Sovereign Wealth Funds as pools of money which could be

[103] This argument mirrors the potential role of the fund as a savior of the domestic banking sector in case of a major financial crisis risk.
[104] The elements in this section are complementary with those already discussed in section 4.1.5.

used to fund partisan conflicts or enrich domestic rulers instead of benefiting to the sum of its citizens.

An economy dependent on natural resource production may not always benefit from a structure managing sovereign wealth because one size does not fit all. Indeed, the decision to set up a fund and which type of fund should depend on key economic features such as domestic investment needs, the resource depletion path, absorption capacities, or the transparency and parliamentary accountability regarding resource revenue management. There is a risk for a country to establish a fund which would not fit the state of the economy and hope that setting up a trendy structure would be considered domestically and internationally as evidence of sound economic management.

Macroeconomic management is especially important in Resource dependent economies due to the exposure to rapid and potentially permanent shifts in resource prices. In this regard, the multiplication of independent actors with the ability to carry out public investments complicates macroeconomic forecasts and frameworks for political deciders.

A country may face difficulties in the management of sovereign wealth in case of low high educated individuals with the proper financial skills. In this case a country would be better-off not to divert this key staff in various structure and may not establish a new structure independent from the budgetary and monetary authority.

4.4. Conclusion

Unlike what most definitions suggest, Sovereign Wealth Funds form a continuum of public funds which could overlap with a variety of institutional entities. Instead of looking at a static representation of these funds, we have highlighted the dynamic nature of the strategies and mandates of those Sovereign Wealth Funds.

This article tried to provide some enlightenment on this concept providing a typology of the funds usually labelled as Sovereign Wealth Funds as well as an identification of other institutional actors with which they could be mixed up. It enabled a debate of the potential inclusion of Sovereign Wealth Funds according to their main function.

With all these discussions in mind, we have focused on resource dependent economies to shed light on how and why Sovereign Wealth Funds could help solve key macroeconomic challenges. However, Sovereign Wealth Funds may not be the panacea for every resource dependent economy and may prove ineffective or even damaging in some cases for the local economy.

This paper warrants a detailed analysis of Sovereign Wealth Funds definitions and evaluating strategies over time. While some efforts have already been done by some organizations to provide comparable features of the funds, they have different frameworks and definitions which complicates comparisons on a broader scale.

While assessing the impact of Sovereign Wealth Funds with dummies is far from satisfying, it is the only available tool to assess their impact on key macroeconomic variables as used in Chapter 2. This paper tried to provide insights and debates for practitioners which would be interested in properly delimiting Sovereign Wealth Funds strategies over time. For policymakers in countries aiming at setting up a Sovereign Wealth, it may shed some light on what lies behind this concept and in what extent it could be helpful or detrimental for macroeconomic policies.

5. General Conclusion

This thesis step aside the resource curse debate by providing deep analyses regarding 3 key macroeconomic challenges in the context of resource dependent economies. It does not discriminate countries according their level of economic development or the resources produced to focus on a set of countries sharing a dependence to volatile international commodity prices, and to include both successes and failures of resource wealth management in the analysis.

Chapter 2 empirically investigated the potential determinants of fiscal procyclicality in resource dependent economies on a sample of 81 countries over 1992-2012. It highlights an impact of political economy factors in explaining a procyclical pattern (absence of political or civil rights, bad governance, political instability), and may limit fiscal procyclicality mainly through a limitation of expenditure growth in good economic periods (low polity fragmentation, democracy, political stability). This chapter is also one of the first to identify an impact of Sovereign Wealth Funds to limit fiscal procyclicality through a limitation of expenditure growth in good economic periods, especially for more ancient funds and saving funds. However, it has not found any evidence of the impact of fiscal rules even though they have been set up to increase the soundness of fiscal policy. Even though it calls for further empirical works, it is a preliminary evidence of a higher relevance of Sovereign Wealth Funds saving some wealth away from the budget than restrictive fiscal rules which may hinder fiscal management.

Then, chapter 3 has included an empirical study of the relationship between commodity price variations and export diversification on a sample of 78 countries over 1970-2012. It identifies a strong evidence of a positive relationship between commodity price variations and export concentration, especially through a concentration of already exported goods (intensive margin). This analysis is complemented by an analysis of commodity price booms and busts episodes which identifies an increase in export concentration during commodity price booms and an increase of export diversification during periods of commodity price busts. It induces that countries may not have taken commodity price booms as an opportunity to diversify and have waited for the reversal of commodity prices to start worrying on export diversification. When comparing the export diversification response to the commodity price booms of the 1970s and 2000s, it supports the idea that exports concentrated more during the 2000s boom than during the 1970s episode. This may suggest that countries may have seen commodity prices has moving to a permanently high-level fed by the demand of emerging economies and global trade liberalization. However, it may have induced the difficulties some of those countries are facing to recover since the commodity price return to a low level.

Finally, chapter 4 provided a critical review and analysis of the notion of Sovereign Wealth Funds which has been a trendy recommendation for countries to manage their resource wealth. It identifies main categories of funds which often belong to the Sovereign Wealth Funds term and identify them in a continuum of public funds. It highlights the difficulties to track effectively the proper natures and mandates of those structures due to interdependences with other institutional actors, as well as to the dynamic nature of sovereign wealth management which involves changes in either names or structure or mandate over time. After having stressed the difficulties of any typology of such funds and trying to identify their interdependences in the continuum of public funds, it has included a discussion of the challenges in front of which those funds may help in the macroeconomic management of resource dependent economies. Those include the Dutch Disease phenomenon, economic diversification, financial development, the stabilization of the budget from commodity

price fluctuations, or the stabilization of the local currency in case of Balance of Payments crisis. It has also highlighted key factors which may limit or hinder the effectiveness of those funds calling for a comprehensive analysis before any decision to launch a fund managing sovereign resource wealth.

This thesis has stressed the importance of analyzing key challenges faced by policymakers in the macroeconomic management of resource dependent economies instead of keeping an outside look. It is especially important because what really matters for those countries may not focus solely on a long-lasting entertaining debate on the resource curse or on the impacts of Sovereign Wealth Funds for global stability or investments in recipients' countries. It calls for further research in a near future which would take more into consideration the view of these economies and provide studies which could help them managing their natural resource wealth.

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