Extractive Industries and Development: An Investigation into the Resource Curse Impact on Happiness, Growth, Export Diversification, and Institutions

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Extractive Industries and Development:
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Winningsindustrieën en ontwikkeling:
Een onderzoek naar de impact van de Resource Curse op geluk, groei, exportdiversificatie en instituties

Thesis

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To my late mother, Souad Al-Rabee, who passed away only six months before the end of my PhD Study
I owe you every success in my life
Rest in peace

I love you

وداعا روضتي الغناء وداعا معبدي القدسي

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Acknowledgments

Five years ago, I decided to fulfil an important milestone in my learning Journey. I decided to pursue my PhD study. Among many possible destinations, I decided to join the International Institute of Social Studies (ISS) of Erasmus University Rotterdam. The reputation of the institute as one of the leading centres for development studies motivated me to select it as a destination for my PhD project. Furthermore, the multidisciplinary nature of the research in the ISS has represents a valuable addition to my intellectual capacity. During the last five years, I have interacted with other social studies scholars and researchers with whom I have shared fruitful discussions, exchanged ideas, and experienced cultural diversity in a productive international environment. The fulfilment of this milestone will have great impact on my future endeavours. First, professionally, it will increase my capacity as an academic and university lecturer. The training and knowledge that I have acquired will be reflected in my ability to provide better teaching and contribute to the research in the Department of Economics at the University of Khartoum. Second, I will be able to contribute to the international community of economic research by conducting rigorous researches and projects.

I have been also lucky to have the opportunity to discover the Netherlands, the country of Bikes, tulips and art. Despite the language barrier, the Dutch were among the most hospitable and friendly people I met. Now, as this journey is approaching its end; I could say that it was not only a huge leap in my knowledge but also in my curiosity to discover more. It has been a journey of discovery, commitment, resilience and a journey of knowledge that I hope will contribute to our understating of the phenomenon of the resource curse. Finally, there is a proverb from our local Sudanese culture states that “Pick the comrades before you walk the path “. So I would like to thank the distinguished comrades who have accompanied me throughout this journey.

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Sabna M.A.Ali

Abstract

Despite the expansion in its literature, the discussion on the natural resource curse and its transmission mechanisms is far from conclusive. The underperformance of the majority of resource-rich countries especially in Africa, the Middle East, and Latin America, justifies the need for more investigation of the phenomenon. The heterogeneity in countries' experiences and the variety of the curse transmission mechanisms emphasize the need for introducing a new perspective that can provide new conceptual and theoretical frameworks and possibly new suggested transmission mechanisms. This thesis is an attempt to probe into a new perspective as well as assessing the traditional transmission mechanisms using different conceptual frameworks. The thesis reaches these objectives in four articles. As a contribution to the theoretical discussion on the resource curse, the thesis brings together the nascent literature on economic growth and happiness, and the well-established literature on the natural resources curse. It tries to see the extent to which and the mechanism through which natural resources rent can affect happiness and subjective well-being in resource-rich economies. The thesis also contributes to the resource curse literature by presenting the unique case of Sudan. Sudan exploited oil between 1999 and 2011 when the country suddenly lost more than 70% of its oil reserves and revenues due to the separation of the oil rich-region of South Sudan. The thesis provides insights into the impact of oil rents on Sudan's economic growth through its impact on a country's economic diversification and growth. Moreover, the thesis will discuss in a descriptive approach how oil rents affect economic growth, unemployment, and economic diversification and institutions in Sudan and South Sudan. Finally, a synthetic control method will be applied to evaluate the trajectory of Sudan's economic growth, export diversification, unemployment, and corruption in the post oil loss era. The objective of this analysis is to examine whether the evolution of these variables in the post-oil loss era can be attributed to the 2011 oil-loss shock.

The thesis comes in seven chapters:

Chapter 1- Introduction: This chapter presents the objectives, questions and expected findings of the included research articles. In this chapter, different experiences of different resource-rich countries are also discussed to provide insights into the different policy choices that each country adopted and their long-term implications on economic growth and development. The chapter also provides an outline of the experience of Sudan and the impact of oil production on the long-term performance of the economy.

Chapter 2- Theoretical Framework on the transmission mechanism of the Natural resource curse: this chapter discusses the conceptual, theoretical and empirical framework of the natural resource thesis. It begins with a review of the theoretical

explanations of the resource curse and then challenges these explanations with an intensive review of the empirical literature on the resource curse.

Chapter 3- Happiness and the resource curse: one of the main objectives of this thesis is to highlight other aspects that can contribute to our understanding of the natural resource curse. In doing so, this chapter investigates the relationship between natural resources and happiness. It represents an attempt to see whether natural resource abundance/dependence affect the subjective well-being of resource-rich citizens and, hence can introduce another perspective to our understanding of the resource curse phenomenon. Consistent with the thesis of the resource curse, the findings of this chapter show that citizens of resource-rich countries tend to be less happy than their counterparts in resource-poor countries. Furthermore, the analysis provides empirical evidence for the negative relationship between oil rents and level of happiness over time. This happiness 'resource curse' curse appears to be oil-specific and holds both for the levels of happiness as well as for the changes in happiness.

Chapter 4- Post-Secession Sudan and South Sudan, a comparative Study of Economic Performance, Export Diversification and Institutions: This chapter uses recent secondary data of both counties to analyse and compare the impact of oil revenue transfers on Sudan and South Sudan economies in the post-secession era. The Chapter will address the impact on export diversification, economic stability and institutions. Based on the outcome of the discussion in this paper, Oil loss has created incentives for export diversification, sound macroeconomic policy as well as institutional improvement in Sudan. Reciprocally, the data of south Sudan's economy reflect a premature oil dependence that led to export concentration, institutional degradation and macroeconomic instability. Accordingly, Sudan has greater likelihood of achieving export diversification, macroeconomic stability and institutional reforms compared to South Sudan.

Chapter 5- Oil, export diversification and economic growth in Sudan, Evidence from a VAR model: This Chapter contributes to the literature of the resource curse by empirically investigating the interaction of oil rents, export diversification, institutional quality and economic growth in the short run in Sudan. Consistent with other resource curse literature, this study shows that oil rents appear to have significant negative impact on export diversification measured by the Herfindahl-Hirschman Index (HHI) in Sudan in the short run. Nonetheless, the study also shows that export diversification has a negative but insignificant impact on economic growth in the short run. Thus, this study reached the conclusion that the poor performance of the Sudanese economy between 1960 and 2018 cannot be blamed on the lack of exports diversification. Accordingly, the assumption that the lack of export diversification is a potential mechanism for the so-called resource curse lacks statistical significance in the case of Sudan. Furthermore, although the study shows a significant positive effect of the rule of law on growth in the short run; it also shows

that the institutional decadence during the oil exploitation period was not oil motivated. These results are valid even in the Vector Autoregressive Analysis (VAR) analysis after South Sudan secession.

Chapter 6 – An Evaluation of the impact of oil reserve loss on Sudan's growth Export Diversification, unemployment and corruption; a synthetic Control Method: when South Sudan separated in 2011 oil was representing 92% of Sudan's total merchandise exports. Today, more than 10 years after South Sudan seceded, the economy is still suffering from the aftermath of the oil loss turmoil. However, although Sudan's exports mix was highly concentrated in 2011, this Chapter argues that the loss of oil reserves has triggered export diversification in Sudan. Using a case-comparison approach called the synthetic control method (SCM), we find that the loss of oil reserve followed the separation of the oil-rich South Sudan in 2011 provoked a significant decrease in the Sudan Herfindahl- Hirschman Index (HHI) and hence reflecting a more diversified export mix in comparison to the period before 2011.

Chapter 7- Findings and Policy Recommendations: this chapter brings together the main conclusion of the different topics discussed in the thesis in an attempt to provide a number of policy recommendations on the optimal management of natural resources in achieving long-term economic growth and sustainable development.

Samenvatting

Ondanks het toenemende aantal publicaties over de natuurlijke hulpbronnenvloek, of de hulpbronnenvloek, en de bijbehorende overdrachtsmechanismen, is hierover nog steeds geen consensus. De achterblijvende prestaties van de meeste landen die rijk zijn aan hulpbronnen, vooral in Afrika, het Midden-Oosten en Latijns-Amerika, rechtvaardigen verder onderzoek naar dit fenomeen. De heterogene ervaringen van deze landen en de diversiteit van de transmissiemechanismen van de vloek benadrukken de noodzaak van een nieuw perspectief dat nieuwe conceptuele en theoretische kaders kan bieden en mogelijk nieuwe transmissiemechanismen kan bieden. Dit proefschrift probeert een nieuw perspectief te verkennen en traditionele transmissiemechanismen te benaderen via verschillende conceptuele kaders. Dit wordt in vier delen uitgewerkt. Het eerste deel van het proefschrift verenigt de opkomende literatuur over de impact van economische groei op geluk met de gevestigde literatuur over natuurlijke hulpbronnen. Hier onderzoek ik in hoeverre en via welk mechanisme de opbrengst van natuurlijke hulpbronnen geluk en subjectief welzijn kan beïnvloeden. Het proefschrift draagt ook bij aan de literatuur over hulpbronnenvloek door het unieke geval van Sudan te presenteren. Sudan exploiteerde olie tussen 1999 en 2011, toen het land plotseling meer dan 70% van zijn oliereserves en inkomsten verloor door de afscheiding van de olierijke regio Zuid-Sudan. Het proefschrift geeft inzicht in de impact van olieprijzen op de economische groei van Soedan door de impact op de economische diversificatie en groei van een land. Bovendien zal het proefschrift in een beschrijvende benadering bespreken hoe olieprijzen de economische groei, werkloosheid en economische diversificatie en instellingen in Sudan en Zuid-Sudan beïnvloeden. Ten slotte zal een synthetische controlemethode worden toegepast om het traject van de economische groei, exportdiversificatie, werkloosheid en corruptie in Soedan in het post-olieverliestijdperk te evalueren. Het doel van deze analyse is na te gaan of de evolutie van deze variabelen in het post-olieverliestijdperk kan worden toegeschreven aan de olieverliesschok van 2011.

Het proefschrift bestaat uit zeven
hoofdstukken:

Hoofdstuk 1. Introductie: Dit hoofdstuk bespreekt de conceptuele en achtergrondinformatie van de grondstoffenvloektheorie. Het omvat ook de onderzoeksdoelen, -vragen en verwachte bevindingen van de hier opgenomen onderzoeksverslagen. In dit hoofdstuk worden ook de uiteenlopende ervaringen van diverse grondstofrijke landen besproken om inzicht te krijgen in de uiteenlopende beleidskeuzes die ieder land heeft gemaakt; en de implicaties hiervan voor economische groei en ontwikkeling op de lange termijn. Dit hoofdstuk geeft ook een

overzicht van de ervaring van Soedan en de impact van olieproductie op de economische prestaties van het land.

Hoofdstuk 2. Theoretisch Kader voor het Transmissiemechanisme van de Grondstoffenvloek: Dit hoofdstuk bespreekt het conceptuele, theoretische en empirische kader van de grondstofhypothese. Het begint met een review van de theoretische verklaringen voor de grondstoffenvloek en benadert deze dan kritisch in een uitgebreide review van de empirische literatuur over de grondstoffenvloek.

Hoofdstuk 3. Winningsindustrieën en Geluk: Een van de belangrijkste doelen van dit proefschrift is om andere aspecten naar voren te brengen die ons kunnen helpen de grondstoffenvloek te begrijpen. Daartoe onderzoekt dit hoofdstuk de relatie tussen natuurlijke grondstoffen en geluk. Het beoogt te onderzoeken of overvloed/afhankelijkheid van natuurlijke grondstoffen daadwerkelijk het subjectief welzijn van grondstofrijke burgers beïnvloedt en kan daarmee een ander perspectief bieden om het fenomeen van de grondstoffenvloek te begrijpen.

Hoofdstuk 4. Soedan en Zuid Soedan Na Splitsing, een Vergelijkend Onderzoek naar Economische Prestatie, Export Diversificatie en Instituties: Dit hoofdstuk gebruikt recente secundaire gegevens van beide landen om de impact van de overdracht van olie-inkomsten op de economie van Soedan en Zuid-Soedan te onderzoeken in het tijdperk na de splitsing. Dit hoofdstuk behandelt de impact op exportdiversificatie, economische stabiliteit en instituties. Uit de discussie in dit artikel volgt dat het verlies van olie in Soedan gezorgd heeft voor prikkels voor exportdiversificatie, solide macro-economisch beleid en institutionele verbetering. Daartegenover laat de data met betrekking tot Zuid-Soedan een premature afhankelijkheid van olie zien, die heeft geresulteerd in concentratie van de export, institutionele degradatie en macro-economische instabiliteit. Zodoende is de kans op exportdiversificatie, macro-economische stabiliteit en institutionele hervormingen groter in Soedan dan in Zuid-Soedan.

Hoofdstuk 5. Olie, Exportdiversificatie en Economische Groei - een Tijdreeksanalyse van Soedan: Dit hoofdstuk levert een bijdrage aan de literatuur over de grondstoffenvloek door middel van empirisch onderzoek naar kortetermijnsinteractie van olieopbrengsten, exportdiversificatie, institutionele kwaliteit en economische groei in Soedan. Net als andere literatuur over de grondstoffenvloek, laat dit onderzoek zien dat olieopbrengsten een aanmerkelijke negatieve impact hebben op exportdiversificatie in Soedan, gemeten door middel van de Herfindahl-Hirschman Index (HHI). Het onderzoek toont echter ook aan dat exportdiversificatie op de korte termijn een negatieve, doch insignificante, impact op economische groei heeft. Daarom concludeert dit onderzoek dat het gebrek aan exportdiversificatie geen blaam treft voor de slechte prestaties van de Soedanese economie tussen 1960 en 2018. Zodoende ontbreekt in de casus Soedan de statistische significantie voor de aanname dat een gebrek aan exportdiversificatie

een potentieel mechanisme voor de zogenaamde grondstoffenvloek is. Bovendien toont dit onderzoek aan dat, hoewel de verbeterde Rule of Law index een significant positief effect op de kortetermijnsgroei heeft gehad, de institutionele decadentie tijdens de olie-exploitatie niet gemotiveerd was door olie. Deze resultaten houden zelfs stand in de Vector Autoregressive (VAR) analyse, na de afscheiding van Zuid-Soedan.

Hoofdstuk 6. Een Evaluatie van de Impact van Oliereserves op de Exportdiversificatie van Soedan - Een Synthetische Controlemethode: Toen Zuid-Soedan zich in 2011 afscheidde, vertegenwoordigde olie 92% van de totale Soedanese goederenexport. Vandaag de dag, meer dan 10 jaar nadat Zuid-Soedan zich afscheidde, lijdt de economie nog steeds onder de nasleep van het tumult dat het verlies van de olie met zich meebracht. Desalniettemin betoogt dit hoofdstuk dat, waar de Soedanese exportmix in 2011 sterk geconcentreerd was, het verlies van olie gezorgd heeft voor exportdiversificatie in Soedan. Door middel van de synthetische controlemethode (SCM), een methode om casussen te vergelijken, hebben we ontdekt dat de HHI in Soedan aanmerkelijk is afgenomen als gevolg van het verlies van oliereserves door de afscheiding van het olierijke Zuid-Soedan in 2011. Zodoende is de export diverser in vergelijking met de periode voor 2011.

Hoofdstuk 7. Bevindingen en Aanbevelingen voor Beleid: Dit hoofdstuk verbindt de verschillende in het proefschrift besproken onderwerpen in een hoofdconclusie en probeert een aantal beleidsadviezen te geven voor optimaal beheer van natuurlijke grondstoffen om op de lange termijn economische groei en duurzame ontwikkeling te bewerkstelligen.

ملخص

على الرغم من التوسع في الأدبيات ، إلا أن النقاش حول لعنة الموارد الطبيعية وآليات انتقالها بعيد كل البعد عن أن يكون قاطعًا. يبرر ضعف أداء غالبية البلدان الغنية بالموارد ، وخاصة في إفريقيا والشرق الأوسط وأمريكا اللاتينية ، الحاجة إلى مزيد من التحقيق في هذه الظاهرة. يؤكد عدم التجانس في تجارب البلدان وتنوع آليات انتقال اللعنة على الحاجة إلى إدخال منظور جديد يمكن أن يوفر أطرًا مفاهيمية ونظرية جديدة وربما آليات نقل مقترحة جديدة. هذه الأطروحة هي محاولة للتحقيق في منظور جديد وكذلك تقييم آليات النقل التقليدية باستخدام أطر مفاهيمية مختلفة. تصل الرسالة إلى هذه الأهداف في أربع مقالات. كمساهمة في المناقشة النظرية حول لعنة الموارد ، تجمع الأطروحة بين الأدبيات الناشئة عن النمو الاقتصادي والسعادة ، والأدبيات الراسخة عن لعنة الموارد الطبيعية. إنه يحاول معرفة مدى وآلية تأثير ريع الموارد الطبيعية على السعادة والرفاهية الذاتية في الاقتصادات الغنية بالموارد. تساهم الأطروحة أيضًا في أدب لعنة الموارد من خلال تقديم حالة السودان الفريدة. استغل السودان النفط بين عامي 1999 و 2011 ، عندما فقدت البلاد فجأة أكثر من 70٪ من احتياطياتها النفطية وعائداتها بسبب انفصال المنطقة الغنية بالنفط في جنوب السودان. توفر الأطروحة نظرة ثاقبة لتأثير أسعار النفط على النمو الاقتصادي في السودان من خلال دراسة تأثيرها على اتنوع الصادرات والنمو الاقتصادي . بالإضافة إلى ذلك ، ستناقش الأطروحة في نهج وصفي كيفية تأثير ريع النفط على النمو الاقتصادي والبطالة والتنويع الاقتصادي والمؤسسات في السودان وجنوب السودان. أخيرًا ، سيتم تطبيق منهجية(Synthetic Control Analysis)لتقييم مسار النمو الاقتصادي وتنويع الصادرات والبطالة والفساد في السودان في حقبة ما بعد فقدان النفط. الغرض من هذا التحليل هو تحديد ما إذا كان تطور هذه المتغيرات في حقبة ما بعد فقدان النفط يمكن أن يُعزى إلى صدمة فقدان النفط في عام 2011.

تأتي الأطروحة في سبعة فصول:

الفصل الأول - مقدمة: يناقش هذا الفصل المعلومات المفاهيمية لأطروحة لعنة الموارد. كما يقدم الهدف والأسئلة والنتائج المتوقعة من الأوراق البحثية المشمولة. في هذا الفصل ، تتم أيضًا مناقشة التجارب المختلفة لمختلف البلدان الغنية بالموارد لتوفير رؤى حول الخيارات السياسية المختلفة التي اعتمدها كل بلد وآثارها طويلة الأجل على النمو الاقتصادي والتنمية. كما يقدم الفصل عرضًا موجزًا لتجربة السودان وتأثير إنتاج النفط على أداء الاقتصاد على المدى الطويل.

الفصل الثاني - الإطار النظري لآلية انتقال لعنة الموارد الطبيعية: يناقش هذا الفصل الإطار المفاهيمي والنظري والتجريبي لأطروحة الموارد الطبيعية. يبدأ بمراجعة التفسيرات النظرية لعنة الموارد ثم يتحدى هذه التفسيرات بمراجعة مكثفة للأدبيات التجريبية لعنة الموارد.

الفصل الثالث - الصناعات الاستخراجية والسعادة: أحد الأهداف الرئيسية لهذه الأطروحة هو تسليط الضوء على الجوانب الأخرى التي يمكن أن تسهم في فهمنا لعنة الموارد الطبيعية. عند القيام بذلك ، يبحث هذا الفصل في العلاقة بين الموارد الطبيعية والسعادة. إنه يمثل محاولة لمعرفة ما إذا كانت وفرة الموارد الطبيعية / الاعتماد عليها تؤثر على الرفاهية الذاتية للمواطنين الغنيين بالموارد ، وبالتالي يمكن أن توفر منظورًا آخر في فهمنا لظاهرة لعنة الموار د.تمشيا مع أطروحة لعنة الموارد ، تظهر نتائج هذا الفصل أن مواطني البلدان الغنية بالموارد يميلون إلى أن يكونوا أقل سعادة من نظرائهم في البلدان الفقيرة بالموارد. علاوة على ذلك ، يقدم التحليل دليلاً

تجريبيًا على العلاقة السلبية بين ريع النفط ومستوى السعادة بمرور الوقت. كما يوضح أن لعنة السعادة "لعنة الموارد" هذه مرتبطة بالنفط .

الفصل الرابع - السودان وجنوب السودان في مرحلة ما بعد الانفصال ، دراسة مقارنة للأداء الاقتصادي وتنويع الصادرات والمؤسسات: يستخدم هذا الفصل البيانات الثانوية الحديثة لكلا البلدين لتحليل ومقارنة تأثير تحويلات عائدات النفط على اقتصادات السودان وجنوب السودان في حقبة ما بعد الانفصال. سيتناول هذا الفصل التأثير على تنويع الصادرات والاستقرار الاقتصادي والمؤسسات. بناءً على نتائج المناقشة في هذه الورقة ، فقد أوجد فقدان النفط حوافز لتنويع الصادرات ، وسياسة اقتصادية كلية سليمة ، فضلاً عن التحسين المؤسسي في السودان. بالمقابل ، تعكس بيانات اقتصاد جنوب السودان اعتمادًا مبكرًا على النفط أدى إلى تركيز الصادرات وتدهور المؤسسات وعدم استقرار الاقتصاد الكلي. وبناءً على ذلك ، فإن السودان لديه احتمالية أكبر لتحقيق تنويع الصادرات واستقرار الاقتصاد الكلي والإصلاحات المؤسسية مقارنة بجنوب السودان.

الفصل الخامس: النفط وتنويع الصادرات والنمو الاقتصادي في السودان ، تحليل نموذج VAR للسودان: يساهم هذا الفصل في أدبيات لعنة الموارد من خلال التحقيق التجريبي في تفاعل ريع النفط وتنويع الصادرات والجودة المؤسسية والنمو الاقتصادي على المدى القصير في السودان. تمشيا مع أدبيات لعنة الموارد الأخرى ، تظهر هذه الدراسة أن إيجارات النفط يبدو أن لها تأثير سلبي كبير على تنويع الصادرات المقاسة بمؤشر هيرفندال هيرشمان (HHI) في السودان على المدى القصير. ومع ذلك ، تظهر الدراسة أيضًا أن تنويع الصادرات له تأثير سلبي ولكنه غير مهم على النمو الاقتصادي على المدى القصير. وبذلك توصلت هذه الدراسة إلى نتيجة مفادها أن الأداء الضعيف للاقتصاد السوداني بين عامي 1960 و 2018 لا يمكن أن يُعزى إلى نقص تنويع الصادرات. وعليه ، فإن الافتراض بأن الافتقار إلى تنويع الصادرات آلية محتملة لما يسمى بلعنة الموارد يفتقر إلى الأهمية الإحصائية في حالة السودان. علاوة على ذلك ، على الرغم من أن الدراسة تظهر تأثيراً إيجابياً هاماً لسيادة القانون على النمو في المدى القصير ؛ كما يظهر أن التدهور المؤسسي خلال فترة استغلال النفط لم يكن بدافع النفط. هذه النتائج صالحة حتى في تحليل VectorAutoregressive Analysis (VAR) بعد انفصال جنوب السودان.

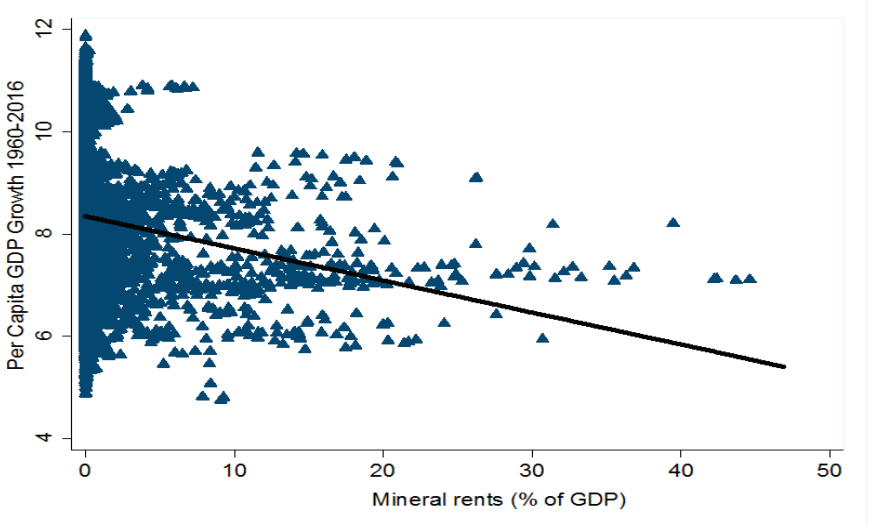
الفصل السادس - تقييم لتأثير فقدان احتياطي النفط على تنويع الصادرات في السودان - طريقة التحكم الاصطناعية: عندما انفصل جنوب السودان في عام 2011 ، كان النفط يمثل 92٪ من إجمالي صادرات السودان السلعية. اليوم ، بعد أكثر من 10 سنوات على انفصال جنوب السودان ، لا يزال الاقتصاد يعاني من آثار اضطراب فقدان النفط. ومع ذلك ، على الرغم من أن مزيج صادرات السودان كان شديد التركيز في عام 2011 ، فإن هذا الفصل يجادل بأن فقدان احتياطيات النفط أدى إلى تنويع الصادرات في السودان. باستخدام منهج مقارنة الحالة يسمى طريقة التحكم التركيبية (SCM) ، وجدنا أن فقدان احتياطي النفط بعد فصل جنوب السودان الغني بالنفط في عام 2011 أدى إلى انخفاض كبير في مؤشر السودان هيرفيندال هيرشمان (HHI) و وبالتالي يعكس مزيجًا أكثر تنوعًا من الصادرات مقارنة بالفترة التي سبقت عام 2011.

الفصل السابع - النتائج والتوصيات المتعلقة بالسياسة: يجمع هذا الفصل الاستنتاج الرئيسي للموضوعات المختلفة التي نوقشت في الأطروحة في محاولة لتقديم عدد من توصيات السياسة بشأن الإدارة المثلى للموارد الطبيعية في تحقيق النمو الاقتصادي المستدام على المدى الطويل.

CHAPTER 1 INTRODUCTION

1. Background and Motivation

Contrary to the economic mainstream consensus, the positive impact of natural resources on economic growth has been challenged by the thesis of the natural resource curse. This thesis has been also empirically supported by a number of studies that have demonstrated the underperformance of resource-rich countries in comparison to their resource-poor counterparts (see Corden and Neary, 1982; Sachs and Warner 1995, 1997, 2001; Van Wijnbergen, 1984; Gylfason, 2000, 2001; Frankel, 2010; Papyrakis and Gerlagh, 2004; and Humphreys, Sachs and Stiglitz, 2007). The natural resource curse refers to the situations in which natural resource dependency negatively affects a country's economic growth and hinders its development. Figure (1) below shows the average per capita GDP growth rate of 193 countries between 1960 and 2016. It reflects the negative correlation between the average GDP growth rate and the share of mineral rents in GDP.

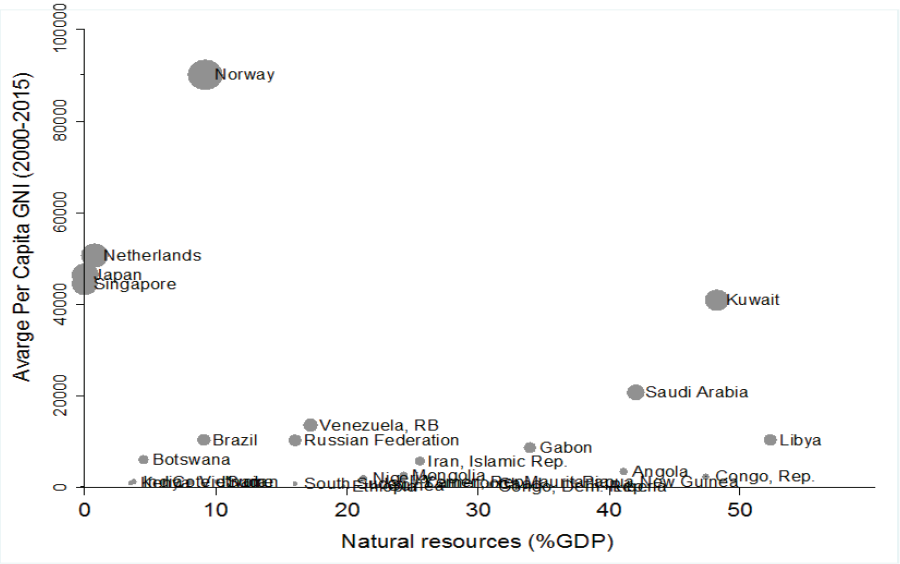


Source: World Development Indicators (WDIs)

Figure 1 Annual Per Capita growth and Mineral Rent

Figure (2) also shows a comparison between resource-rich and resource-poor countries' per capita Gross National Income (GNI) between 2000 and 2015. The figure shows that, with the exception of a few resource-rich countries such as the Netherlands, Norway, and Botswana, the average per capita GNI for countries like Japan and Singapore is twice that of countries which are immensely resource-rich

like Saudi Arabia, Venezuela, and Brazil. A great number of empirical studies that focus on developing countries have also revealed the negative correlation between natural resources and the number of economic development indicators, such as economic diversification, human capital, poverty, innovation, investment, and entrepreneurship (see Sachs and Warner, 2001; Gylfason, 2001; Papyrakis and Gerlagh, 2007; Birdsall, Pinckney and Sabot 2001; Bravo-Ortega and Gregorio, 2007; and Murshed, 2018).

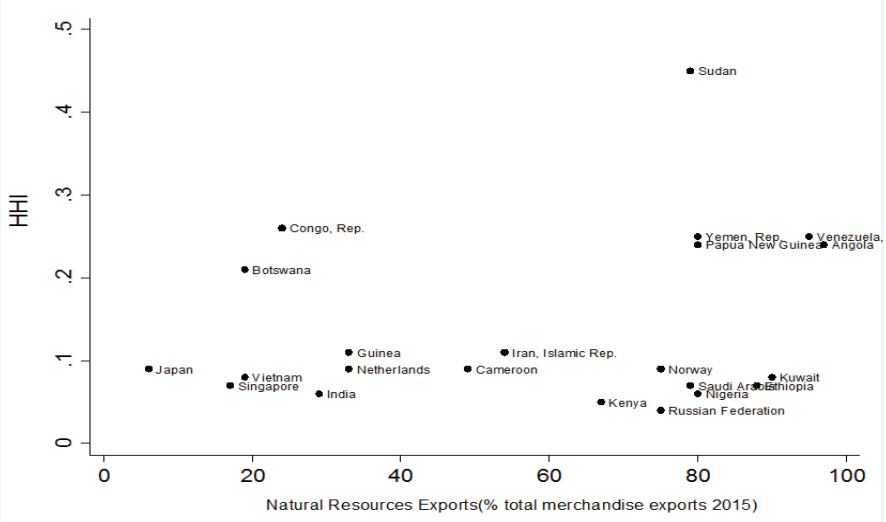


Source: WDIs

Figure 2 Average Per Capita GNI and Natural Resource Rent % GDP

One of the most important explanations of the natural resource curse is the Dutch Disease. The Dutch Disease attributes the economic growth decline of resource-rich countries to the decline of the manufacturing sector along with the expansion of the primary resource sector. Moreover, studies on the Dutch Disease also demonstrate that an abundance of resources does not only crowd-out the existing manufacturing sectors but also hinders economic diversification in the long run (see Auty, 1988, 1993; Humphreys, Sachs and Stiglitz, 2007; Gelb, 2010; and Malik and Temple, 2009). Using the Herfindahl-Hirschman Index (HHI) as a measure of economic concentration, Figure (4) exhibits the negative relationship between the share of natural resource in total exports and the HHI for 33 countries between 2000 and 2015. It shows that, with the exception of some countries, the majority of resource-rich countries have achieved very high HHI levels compared with resource-poor countries. This could be explained by the fact that resource-dependent economies tend to have less diversified export mix in comparison with non-resource dependent

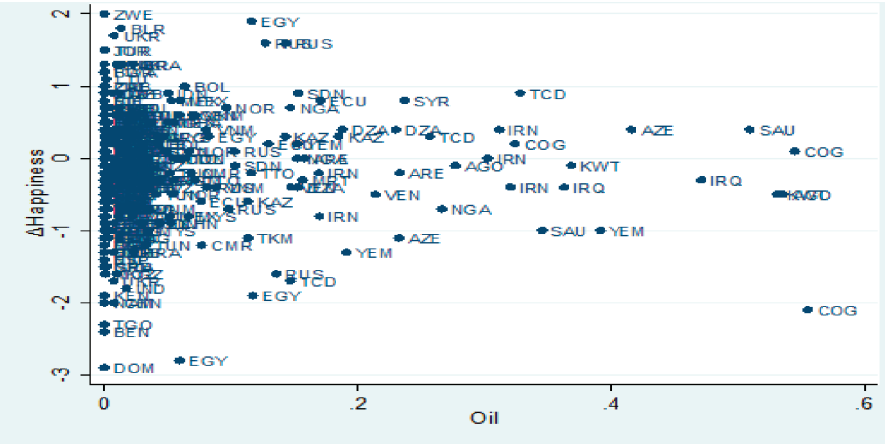
economies. However, given the performance of countries like Norway, Russia, and the Netherlands, it also demonstrates that export diversification could be achievable even in resource- abundant economies. Figure (3) also shows that countries like Botswana, which are known in the literature as one of the resource curse survivors, has yet to achieve significant export diversification. Hence, it could be concluded that there is a divergence in the experiences of different resource rich-countries with respect to export diversification. This divergence raises questions about what are the real factors that determine export diversification in these countries.



Source: UNCTAD

Figure 3 Share of natural resources in merchandise Exports and HHI

A growing nascent literature in economics has been examining the impact of economic growth on subjective well-being. This literature sheds the light on the impact of natural resource abundance on happiness and subjective well-being. It also opens up the discussion to whether the impact of resource endowment on happiness can provide new insights into the resource curse as well as adding to the discussion of the resource curse transmission mechanism. It is assumed that natural resource abundance can affect happiness through its impact on determinants of happiness, such as unemployment, inflation, environmental degradation, and inequality (see Asadullah et al. 2018; Blanchflower and Oswald, 2004; Ferrer-i-Carbonell and Gowdy, 2007; and di Tella and MacCulloch, 2008). Figure (4) shows the negative correlation between natural resources and differences in happiness across countries between 1990 and 2015.



Data Source: world happiness data

Figure 4 Changes in Happiness and Resource Abundance all years

However, despite the empirical support of the resource curse, the differences in a country's experiences challenge the available explanations provided by researchers of the natural resource curse and stimulate the need for further scrutiny that can provide further explanation and improve our understanding of the phenomenon. Stevens (2003) and Gylfason (2001) point out that resource-rich countries (for example, Norway) might be immune to the curse. This opens the door for further investigations that take into account the special characteristics of each country. Historically, countries such as Ecuador have experienced higher per capita income generated by their booming sector; Furthermore, the United Kingdom and Germany have both benefited from their natural resources and have successfully utilized them in transforming their economies to modern manufacturing-led economies. Therefore, given these examples of countries successfully benefitting from their natural resources the question is what really goes wrong with those resource-cursed economies? The next section will discuss this question in more details.

1.2 Different Country Experiences

This section demonstrates how some countries were not only able to avoid the drawbacks of resource dependence but were also very successful in diversifying their economies away from the primary sector. Furthermore, it shows that while some other countries were successful in managing their abundant resources, they still found it difficult to achieve a satisfactory level of export diversification.The experience of Sudan provides another example of the resource curse. However, at the same time, the case of Sudan is unique since it represents the case of a highly oil-dependent economy that has suddenly lost more than 70% of its oil resources.

This situation could provide the macroeconomist with a rare opportunity to study the impact of this sudden loss on macroeconomic indicators. Sudan exploited its oil reserves for fifteen years. During these years, oil is claimed to negatively affect the economy as well as the institutions quality. In 2011, the country's oil-rich region separated and the economy had to face all the negative consequences of fifteen years of oil dependence. This has resulted in a general economic collapse that has manifested itself in the deterioration of the country's currency, economic contraction, and high inflation and unemployment rates.

Oil dependence created entrenched structural barriers and institutional havoc that left the economy fragile and led to the inevitable economic crisis that took place after the secession of South Sudan in 2011. Prior to oil, the growth of the Sudanese agricultural economy was neither stable nor steady. In fact, the economy was suffering from macroeconomic instability and increasing inflation rates since 1977 that reached its peak of 8.76% in 1981. The economy was growing on an average of 3%[2] during the period from 1977 to 2000. Nonetheless, an infant industrial sector was growing during the era that preceded oil exploitation. Soon after its exploitation, the oil sector boomed and dominated the economy to become the major source of government revenues and the major component in the country's total export mix. As a result, economic growth continuously accelerated. The economy was growing on average of 5.3%, varying from the highest rate of 10% in 2007 and the lowest of 6.1% in 2003[3]. Inflation rates also experienced a substantial decline to only one digit with an average of 10% during the same period[4].

However, the exploitation of oil for the first time in 1999 also brought considerable challenges to the economy. The period from 2000 to 2010 witnessed an increase in oil dependency especially the share of oil on public revenues that has soared dramatically from 43% to 50% in 2000 and to 66% and 95% in 2006 and 2008, respectively (Nour, 2011). Crude oil also dominated Sudan's exports by more than 90% in 2015, which increased the economy's vulnerability to external shocks. The emergence of the booming oil sector was also associated with manufacturing sector stagnation and agricultural sector deterioration as well as the prosperity of the non-tradable service sector. During the period between 1996 and 2010, agricultural sector participation in GDP was reduced from 48% to only 23%, and the participation of the industrial sector did not exceed 5.6% (Nour, 2011).

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[1] Yol.M.A, *Determinants of inflation in Sudan*, Policies, Research and Statistics, Central Bank of Sudan, 2010

[2] UNDP Sudan Team, *Macroeconomic policies for poverty reduction the case of Sudan*, United Nation Development Programme, Sudan (2006)

[3]UNDP Sudan Team, *Macroeconomic policies for poverty reduction the case of Sudan*, United Nation Development Programme, Sudan (2006)

[4] UNDP Sudan Team, *Macroeconomic policies for poverty reduction the case of Sudan*, United Nation Development Programme, Sudan (2006)

Sudan also underperformed in development indicators. The exploitation of oil was associated with the deterioration of the country's development indicators. For instance, Sudan ranked number 164 in the Human Development Index (HDI) in 2010 with a score of only 0.461. This score put Sudan among the group of lowest developed countries. Furthermore, the evolution of the oil sector also coincided with the deterioration of the country's institutions. In 2017, the country ranked number 170 out of 180 countries and territories[5]. Oil was also said to play an important role in deepening the conflict in South Sudan and the emergence of the Darfur conflict (see Batruch, 2004; Cobham, 2006; Patey, 2007, 2010, 2012). The production of oil also prolonged the autocratic regime, which had overturned the democratic government in 1989 and had been ruling the country since then. Moreover, the regime encouraged rent seeking and hence concentrated the oil wealth to its very inner circle. As a result, the highly oil-dependent North Sudan economy deteriorated rapidly after the secession of South Sudan. Growth rates fell from 12% in 2012 to 4% in 2017 and to just 3% in 2018. The country's currency also deflated rapidly during the last two years due to high inflation rates that hit 54.4% in January 2016. The Sudanese pound dropped to 28.7 per $1 USD in January 2018[7] and then to 32 per $1 USD in April 2018.

Norway

Norway is considered the benchmark of resource-curse escape among all resource-rich countries. Country's oil discovery and exploitations have stimulated steady growth of an average of 4% since the 1960's. However, oil share in GDP grew gradually over the 20 years that followed its discovery until it reached the level of 20% of the country's GDP growth. Moreover, during the 1970's, expansion in public spending stimulated by oil revenues reduced the country's export competitiveness. It was only since the 1980's that the country began to adopt policies aimed at the reduction of oil dependency. These policies began with the creation of the Government Pension Fund Global to absorb the spending affected by oil revenues (Holden, 2013).

The creation of this fund played an important role in enabling the economy to avoid the resource curse. The Norwegian government also adopted policies that increased transparency and prevented corruption and rent seeking. Over time the Norwegian government invested 80%[8] of this global fund internationally, and the benefits were distributed equally and transparently among Norwegian citizens. Moreover, the

[5] https://data.worldbank.org/ last visited 22/12/2018

[6] https://tradingeconomics.com/sudan/inflation-cpi,last visited 12/05/2018

[7] https://www.reuters.com/article/sudan-economy/sudans-pound-drops-against-dollar-on-black-market-say-traders-idUSL8N1OX2KJ,last visited 12/05/2018

[8] https://futurechallenges.org/local/the-wealth-of-a-nation-how-norway-escaped-the-oil-curse/ visited 10/05/2018

positive impact of these policies was not only reflected in the economic progress represented by GDP growth but also in sustainable development. A quick look at Norway's HDI performance between 1960 and 2018 reveals that Norway made a significant move in translating its oil revenues into sustainable development that benefited all Norwegians. According to this index, Norway is ranked number 1 in the HDI out of 180 countries with a score of 0.949. Institutionally, anti-corruption measurements have played an important role in creating a conducive environment that is required to achieve the ultimate goals of these policies. Today, according to Transparency International, the country is ranked number 3 out of 180 countries as one of the most transparent countries in the world[9].

Botswana

The case of Botswana provides evidence that the avoidance of the resource curse is not limited to developed countries. Since its independence in 1966, the economy has continued to grow at high rates, and it even achieved growth rates of 21% in 1971 and 1978 and 19% in 1988. More recently, this growth rate has continued on average at 4.3% annually, which makes it one of the fastest growing economies in Africa. Botswana's success has been discussed extensively in the resource curse literature (see Meijia and Castel, 2001; Sarraf and Jiwanji, 2001). The majority of these studies attribute Botswana's success to prudent governance, political stability, and a robust fiscal regime. By adapting these successful strategies, the country has been able to translate its wealth into economic prosperity and sustainable development. Botswana's rank in the HDI is 108, and, between 1990 and 2015, its score continually improved from 0.585 to 0.698[10].

Unlike other resource-rich countries, Botswana has focused on diversifying its economy to reduce the dependence on diamond revenues, diminishing the impact of diamond price shocks. To diversify its economy Botswana adopted policies which have resulted in creating a business–friendly environment, improving the country's business capacity, improving institutions, and ensuring financial sector stability. In addition, the country has also created agricultural and tourism projects to further drive economic diversification. Furthermore, a national development plan was also launched and integrated with the country's budgetary process to promote efficient management of the diamond windfall. The robustness of Botswana's institutions prevented corruption and rent-seeking as well as the accumulation of wealth in the hands of small elite groups. Today, Botswana is ranked number 34 out of 180 in the corruption perception index according to International Transparency (2017)[11].

[9] https://www.transparency.org/country/NOR visited 12/05/2018

[10] Human Development Report, 2016

[11] https://www.transparency.org/country/BWA ,last visited 12/05/2018

Venezuela

In contrast to Norway and Botswana, Venezuela represents the model example of the resource curse. Venezuela is one of the oldest producers of oil, which was discovered in 1917. The country's oil production has grown sharply since then, and in 1929 Venezuela was the world's largest oil exporter until it was overtaken by Saudi Arabia in 1970. However, during those decades, the contribution of oil grew rapidly and ultimately dominated the country's exports as well as government revenues (Rossi, 2011). Moreover, the country's real exchange rate appreciation has reduced the capacity of other commercial goods in international markets. As a result, entrepreneurship has been pulled away from productive sectors in rural areas towards cities to compete for part of the remunerative oil revenues.

The oil sector dominance also had a destructive impact on Venezuela's agricultural sector. Farmers in rural areas abandoned their lands and moved to the cities to work in fast growing non-tradable construction businesses. With the expropriation of the oil sector in 1975, the government's role in the economy grew exponentially. As time passed, the government became the main provider of all production needs for both the private and public sectors through its control of both manufacturing and final goods. In an attempt to diversify the economy away from oil, the government launched many industrial projects. However, the majority of these projects failed in achieving their ultimate goals due to a combination of mismanagement and institutional degradation. As a result, the actual outcomes of these projects have been a huge burden of subsidies and more debt in government's budget, which has inflated exponentially over time. This has ultimately resulted in economic distortions that have hampered economic growth and prevented sustainable development. Moreover, oil production in Venezuela has also been linked to the deterioration of institutions and the spread of corruption. In 2017, the country was ranked 164 out of 180 countries in the corruption perception index. Oil revenues have also extended the time span for rulers and government officials, which in turn has hindered the country's transformation to democracy and rule of law (Papyrakis, 2006).

Equatorial Guinea

Another example of resource management failure is the case of Equatorial Guinea. Despite growth gains (from -1% in 1990 to a peak of 149% in 1997) after the discovery of oil in 1990, the country has failed to translate these growth gains into prosperity and sustainable development for Guineans. The country's statistics demonstrate a large gap between the country's rank in GDP per capita based on Purchasing Power Parity (PPP), which is 23 and its rank in the HDI, which is 135 out of 188 countries and territories[12]. In fact, Equatorial Guinea's HDI value of 0.592 is

[12] world-gdp-per-capita-ranking-2017-data-and-charts-forecast, IMF: World Economic Outlook (WEO) Database, April 2018

considered less than the average of the medium developed group, which is 0.631. Like many resource-rich countries, their economy suffers from a high dependency on oil as the main source of government revenues and economic growth, and a lack of economic diversity. Over time, oil has crowded out other sources of revenues such as palm oil, cocoa, and timber. In 2015, oil represented more than 47% of country's GDP and the share of oil in total exports was estimated to be more than 98%. In addition, the fact that the country's oil prospects are located offshore makes the industry very capital intensive, and hence very weak in creating backward and forward linkages. Moreover, despite the long-term steady growth of the Guinean economy, the path of short-term economic growth has shown much volatility with the movement of oil prices. These fluctuations have increased uncertainty and reduced economic stability, which in turn has discouraged domestic and foreign non-resource investments. Furthermore, according to Serrano (2010), the nation's oil wealth has been linked to weak institutions and corruption in Equatorial Guinea. Moreover, he also claimed that Oil rents played a pivotal role in prolonging the regime of Teodoro Obiang Nguema for almost forty years. In 2017, Transparency International ranked Equatorial Guinea as number 130 in the corruption perceptions index out of 180 countries and territories in 2019[13]

1.3 Research Objective and Thesis Questions

The theoretical literature of the resource curse and the empirical evidence has uncovered many aspects of the resource paradox. However, the suggested transmission mechanisms, contradictions in the empirical findings, and the individual experiences of different countries introduce a challenge to what we know so far about the phenomenon and highlights possible gaps in our understanding of this phenomenon. This thesis is motivated by these possible gaps in the literature of the resource curse. It is an attempt to introduce a new perspective for the natural resource curse that can identify new transmission mechanisms of the curse. In doing so, the thesis will discuss the relationship between the natural resource curse and subjective wellbeing. The thesis also probes into the traditional transmission mechanisms in an effort to highlight some aspects that have been neglected in the literature. The thesis will discuss in a descriptive approach how oil rents affect economic growth, unemployment, and economic diversification and institutions in Sudan and South Sudan. Moreover, the thesis has empirically investigated the evolution of Sudan's economic performance and institutional quality during the oi era. It attempts to trace the footprints of the resource curse in Sudan. . In the light of these objectives, this thesis is trying to answer the following major questions:

- Can the natural resource curse manifest itself into a happiness curse?

[13] https://www.transparency.org/en/countries/guinea

- How does transfer of the oil reserve from Sudan to South Sudan after 2011 affect both countries' export diversification, growth, and institutions?

- Can the lack of export diversification and the deterioration of institutions in Sudan be attributed to oil rent?

- How would have Sudan's economic growth and export diversification evolved in the absence of the sudden oil loss resource which followed the secession of South Sudan back in 2011?

1.4 Structure of the Thesis and Output

This thesis contains the following seven chapters:

Chapter 1- Introduction: this chapter discusses the conceptual framework of the resource curse thesis. It also introduces the objective, questions, and expected findings of the included research papers. In this chapter, different experiences of different resource-rich countries are also discussed to provide insights into the different policy choices that each country has adopted and their long-term implications on economic growth and development. The chapter also provides an outline of the experience of Sudan and the impact of oil production on the long-term performance of the economy.

Chapter 2- Theoretical Framework on the Transmission Mechanism of the Natural Resource Curse: this chapter discusses the conceptual, theoretical and empirical framework of the natural resource thesis. It begins with a review of the theoretical explanations of the resource curse and then challenges these explanations with an intensive review of the empirical literature of the resource curse.

Chapter 3- Happiness and the resource curse: one of the main objectives of this thesis is to highlight other aspects that can contribute to our understanding of the natural resource curse. In doing so, this chapter investigates the relationship between natural resources and happiness. It represents an attempt to see whether natural resource abundance/dependence does affect the subjective well-being of resource-rich citizens and, hence, can provide another perspective in our understanding of the resource curse phenomenon.

Chapter 4- Post-Secession Sudan and South Sudan - a Comparative Study of Economic Performance, Export Diversification and Institutions: This chapter uses recent secondary data on Sudan and South Sudan to analyse and compare the impact of oil revenue transfers on both countries' economies in the post-secession era. The Chapter will address the impact on export diversification, economic stability, and institutions. Based on the outcome of the discussion here, this paper will show that oil loss has created incentives for export diversification, sound macroeconomic policy as well as institutional improvement in Sudan. In contrast, the data on South

Sudan's economy reflect a premature oil dependence that has led to export concentration, institutional degradation, and macroeconomic instability. Accordingly, Sudan has greater likelihood of achieving export diversification, macroeconomic stability, and institutional reforms compared to South Sudan.

Chapter 5- Oil, Export Diversification and Economic Growth in Sudan –Evidence from a VAR model: This chapter contributes to the literature of the resource curse by empirically investigating the interaction of oil rents, export diversification, institutional quality, and economic growth in the short run in Sudan. Consistent with other resource curse literature, this study shows that oil rents appear to have had significant negative impact on Sudan's export diversification measured by the Herfindahl- Hirschman Index (HHI) in the short run. Nonetheless, in this time period, the study also shows that although export diversification has had a negative effect on economic growth, its impact has been relatively insignificant. Therefore, this study has reached the conclusion that the poor performance of the Sudanese economy between 1960 and 2018 cannot be blamed on the lack of export diversification. Accordingly, the assumption that the lack of export diversification is a potential mechanism for the so-called resource curse lacks statistical significance in the case of Sudan. Furthermore, although the study shows a significant positive effect of the rule of law on growth in the short run; it also shows that the institutional decadence during the oil exploitation period was not oil motivated. These results are valid even in the Vector Autoregressive Analysis (VAR) analysis after South Sudan secession.

Chapter 6 – An Evaluation of the Impact of Oil Reserve Loss on Sudan's Export Diversification - A synthetic Control Method: when South Sudan separated in 2011, oil represented 92% of Sudan's total merchandise exports. Today, more than 10 years after South Sudan seceded, the economy is still suffering from the aftermath of the oil loss turmoil. However, although Sudan's export mix was highly concentrated in 2011, this chapter argues that the loss of oil reserves has triggered export diversification in Sudan. Using a case-comparison approach called the synthetic control method (SCM), we find that the loss of oil reserves following the separation of the oil-rich South Sudan in 2011 provoked a significant decrease in the Sudan Herfindahl- Hirschman Index (HHI) and, hence, reflected a more diversified export mix in comparison to the period before 2011.

Chapter 7- Conclusion, policy recommendations, contribution and suggestions for future research: this chapter brings together the main conclusion of the different topics discussed in the thesis in an attempt to provide a number of policy recommendations on the optimal management of natural resources in achieving long-term economic growth and sustainable development.

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CHAPTER 2 THEORETICAL FRAMEWORK AND THE CURSE TRANSMISSION MECHANISMS

1. The Resource Curse Thesis So Far

The literature on the natural resource curse has increased rapidly since it was first introduced in Corden and Neary's article in 1982. Vast literature has also emerged in an attempt to understand the mechanism through which natural resources affect economic growth and development. However, the majority of the economic literature on the resource curse focuses on the impact of resources on economic growth. This literature could be classified into three main branches: the Dutch disease, price volatility, and economic mismanagement. In the same vein, political researchers and political economists have also enriched the theoretical discussion on the resource curse by adding three other explanations: the rent-seeking behaviour, institutional degradation, and the potentiality of conflicts. In his recent book, Murshed (2018), has emphasized on the interference between the economic and the political resource curse. He shows that although the curse is economically reflected in poor economic performance stimulated by the Dutch disease, it is also manifested in poor institutional performance induced by rent-seeking behaviour. As a result, he has claimed that there would be no resource curse in the presence of good institutions concluding that the economic and the political (institutional) transmission mechanisms of the resource curse are inseparably connected. Thus, they could be equally blamed for the curse occurrence in resource-rich countries. More recently, there has been a growing literature examining the relationship between resource abundance/dependence and subjective well-being. This group of studies attempts to bring together the literature on growth and subjective well-being and the literature on growth and natural resources to create a new perspective that can provide more insight into this phenomenon. However, it is important to note that there is no strict separation between these three perspectives; indeed, in many cases, their effects overlap. However, empirically this overlap creates endogeneity between variables when a statistical examination of the resource curse transmission mechanism is conducted using any of the above-mentioned frameworks. The section below discusses these transmission channels in more detail.

1.1 The Dutch Disease

Differences in economic performance between manufacturing and resource dependent economies provide the theoretical basis for the Dutch disease. This argument is based on the assumption of short-run, non-elastic prices of primary products in comparison to the prices of manufacturing commodities (Prebisch-Singer, 1950). Consequently, the Dutch disease thesis predicts that the appreciation of the real exchange rate, stimulated by resource revenues, will demolish the manufacturing sector in the resource economy and, hence, will leave the economy

captive to the internationally declining primary sector. According to the Dutch disease thesis, resource revenues have two effects on the economy: the spending effect and the crowding-out effect. With the first effect, resource revenues will increase government as well as private spending, which consequently, leads to higher inflation and real exchange rates. This, in turn, will put pressure on the non-tradeable products and reduce their competitiveness at the international level. (Frankel and Romer, 1999). In contrast, Malthus (1872) and Hotelling (1931) argue that, in the long term, the prices of the non-renewable resources such as oil and minerals are expected to increase due to the reduction in their limited supply. But this argument has been challenged on the basis that extractive industries are characterized by overproduction in order to mitigate against the risk of reserve expropriation. This supports the assumption that prices of extractive products tend to decline in the long run (Frankel, 2010).

With the second effect, the increase in the inflation and exchange rate stimulated by the resource rents will lead to an increase in the price of production factors. This will push up the production costs in the industrial sector and reduce its participation in GDP in the long run. Given the importance of the industrial sector for economic growth, the deindustrialization process caused by the Dutch disease mechanism will inevitably hinder economic growth in the long-term (Gylfason, 2001a). The deterioration of the industrial sector will increase the demand of the non-tradable and hence push up their prices. This will, over time, crowd out production factors and even entrepreneurship towards the production of non- tradable commodities. A study of the short-term macro-economic impact of oil price increases on net exporting economies shows that the appreciation of currencies of some oil-resource countries have the same impact as higher transfers from abroad. The transfers from abroad lead to an increase in the demand for non-tradable services and shifts the resources from the tradable sector to the non-tradable one. This study claims that the final impact in the short term is either repressed inflation or classical unemployment, and the outcome mainly depends on the size of tradable goods in the Consumer Price Index (CPI). If tradable goods are big components of the CPI, then the impact will be repressed inflation, such as the case in the Gulf countries, whereas if the component of tradable goods in the CPI is not large, the final macroeconomic impact will be classical unemployment (see Van Wijnbergen, 1984).

Nonetheless, despite the sound theoretical foundation of the Dutch disease argument, the findings of the empirical studies do not provide strong support for its predictions (see Sala-i-Martin, Artadi, E.V. and Subramanian, 2003). Furthermore, the divergence in the findings of country-based case studies challenges the validity of the thesis (see Auty 2001a; Filho and Weeks, 2013 and Allcott and Kenistone, 2018).

1.2 The Instability of Natural Resource Prices

Natural resource prices and especially extractive ones are highly volatile. This volatility is attributed to the uneven geographical distribution of their reserves as well as to their location in politically unstable territories. These factors introduce price volatility as one of the transmission mechanisms of the resource curse, especially in oil-rich countries. The fluctuation in commodity prices creates uncertainty around expected revenues, and, hence, negatively affects governments' spending plans, especially those related to long-term infrastructure projects (see Davis and Tilton 2005; Frankel 2001; Cavalcanti, Mohaddes and Raissi, 2013; Ross, 2015; Stevens, Lahan and Kooroshy, 2015; and Venables 2016). The uncertainty also has a negative impact on macroeconomic stability and, hence, private investments. Moreover, the uncertainty created by these fluctuations prevents the development of strong financial institutions, making it more difficult for investors to hedge against economic busts in the short-run. Empirically, this transmission mechanism has been supported by a group of studies that proves the existence of a strong relationship between economic stability and economic growth (See Mabro, 2005). Whilst studies by Mabor (2005) and Mikesell (1979) show a strong correlation between revenues and economic growth of oil producing countries, oil remains as one of the most volatile commodities in the international market due to differences in production capacities, speculation, and geopolitical factors. Nonetheless, it is important to point out that some studies have not established the relationship between international commodity prices and economic growth (Sachs and Warner, 1995a). In addition, Davis and Tilton (2005) argue that these volatilities could have beneficial effects on resource-rich economies since they can encourage the adaptation of stricter fiscal and reform policies.

1.3 Rent Seeking

This transmission mechanism has been introduced by political scientists as part of an institutional explanation of the resource curse. Rent-seeking normally arises in countries that are rich with extractive resources, such as minerals and oil. In effect, it represents a situation in which the resource rents are concentrated in the hands of a small group or groups of political elites who are contesting for a bigger portion of mineral rents. This process erodes social capital, which is based on production linkages and replaces it with another which is based on who is contesting for a bigger portion of the resource revenues. This process will eventually erode the economy's institutional capacity and leads to the spread corruption. Additionally, the concentration of the country's wealth in these small contesting groups will create income inequalities and reduce government investment in infrastructure, which is critical for the development of the manufacturing sector (see Hodler, 2006; and Deacon and Rode, 2012). Some studies also show that rent-seeking hinders economic growth because it prevents the accessibility to education and political participation, Wadho, (2014).

1.4 Institutions Malfunctioning

Institutional degradation or the 'institutional disease' is politically synonymous with the Dutch disease in the literature of the resource curse. This mechanism links resource rents to the erosion of institutional quality in resource-rich economies. Furthermore, the damages to the institutional capacity of these economies will manifest itself in corruption, lack of accountability, and lack of transparency. This in turn will impact the economy in different ways that will all ultimately hinder long-term economic growth and development. First, weak institutions will deteriorate economic governance leading to the inefficiency in resource allocation. Second, the lack of transparency will reduce the ability of the economy to attract foreign direct investments. Moreover, the negative impact on institutions is expected to be higher in non-democratic systems due to natural resource revenues in such systems being shown to stimulate and promote corruption (see Battcharaya and Hodler, 2010; Arezki and Gylfason, 2011; Sala-i-Martin and Supermanian, 2003; and Mavrotas, Murshed and Torres, 2011). Natural resources are also said to hinder country's transition from an autocratic to a democratic system. This is because resources, and especially minerals, are normally located in one place, which makes it easier for autocratic systems to capture and control them. It also makes it easier to exclude other stakeholders form accessing them (McFerson, 2010).

The resource curse literature also widely support the notion that weak institutions developed by oil revenues increases inequalities (See Sachs and Warner, 1995 and Humphreys, Sachs, Stiglitz, Soros, and Humphreys, 2007). Moreover, the literature argues that oil rents are recycled through patronage in oil rich-countries, where political elites normally compete to capture the majority of the rent. This results in inequalities, corruption, and lack of accountability and transparency (Auty, 1990, 2001, 2007). Many scholars advocate that point resources (such as oil, minerals, plantation crops, and coffee) are the most damaging natural resources for institutions (see Frankel, 2010 and Bulte, Damania and Deacon, 2005). However, it is important to point out that some studies challenge the assumption that oil induces poor institutions and suggest that it is, in fact, the other way around. This stream of literature claim that the quality of the institutions prior to oil discovery determines whether oil rents will be a blessing or a curse (see Mehlum, Moene and Torvik, 2006 and Robinson, Torvik and Verdier, 2006).

1.5 Export Diversification

Many studies show that, with the exception of a few examples, the majority of resource-rich economies are characterized by a lack of export diversification. This is attributed to the deindustrialization caused by the Dutch disease process or structural barriers, such as the lack of forward and backward linkages in the economy. Although the consensus among economists is on the importance of economic diversification for long-term economic growth, it is even more critical in the case of resource-rich countries since diversification can help in reducing the

effect of the Dutch disease as well as the impact of price volatility on public finances. This diversification, in turn, will enhance economic stability and ensure sustainable development (see Auty, 1988, 1993; and Gelb 2010). Nonetheless, a quick look at the experiences of resource-rich countries reflects a huge divergence in these countries' accomplishment in terms of export diversification. Many scholars (e.g., Bloom et al., 1998) attribute this divergence to the geographical location of each country. Acemoglu and Zilibotti (1997), on the other hand, claim that resource rich economies are less diversified due to the lack of innovation. Murphy, Shleifer and Vishny (1993) suggest that the export concentration of resource-rich economies is one of the consequences of the rent-seeking process which reduces the economy's ability to diversify. For example, many scholars (Karl, 1997; Jones, Luong and Weinthal, 2001; Isham et al., 2005; Beblawi and Luciani, 1987; Bueno de Mesquita et al., 2003) introduce an institutional explanation for this economic problem. They argue that there is always a trade-off between economic growth and diversification on the one hand and power concentration on the other in resource-rich countries. However, in most cases, the elites will choose to concentrate the economy because it will make it easier for them to control and possess the power among their inner circle. As a result, revenues from booming sectors will not be equally distributed or even invested in the infrastructure, both of which are essential for export diversification.

1.6 The Well-Being Perspective

A very recent branch in economics has focused on subjective well-being and economic growth. Relatedly, in the natural resource curse framework, the main question is whether resource rents increase the subjective well-being of those in resource-rich countries. Empirical literature in recent decades has probed into the determinants of happiness and subjective well-being (using either country or household data). The assumption is that resources affect happiness through their negative impact on a number of economic and development indicators. First, resource abundance affects happiness through its impact on income in the long term. A number of papers in the happiness literature have examined the importance of absolute, relative, and past income in explaining variations in reported happiness (see Asadullah, et al. 2017; Clark et al. 2008; and Frey 2008). Some of them are in support of the so-called Easterlin paradox, which suggests that increasing the average income (at the country level) yields diminishing marginal gains in average happiness (see Blanchflower and Oswald, 2004; Easterlin and Angelescu, 2012; and di Tella and MacCulloch, 2008).

Moreover, other socio-economic and environmental factors, which are also affected by the resource rent, appear to explain variation in reported happiness. Resource rents negatively correlate with unemployment, and several studies also support the negative correlation between happiness and unemployment (di Tella et al., 2001). Hence, it could be claimed that resource abundance indirectly affects

happiness through its impact on unemployment. Another transmission through which resources can affect happiness is inflation. It is widely accepted that natural resource rents increase inflation through the Dutch disease mechanism. In addition, many studies argue that inflation can potentially reduce happiness because of the ensuing uncertainty regarding changes in the cost of living and real income (Shiller, 1997). Thus, inflation can be attributed to the negative relationship between happiness and resource rents. In other words, resource rents reduce happiness because they increase inflation. The negative relationship between resource rents and education also provides a possible explanation for the negative correlation between happiness and resource rents. It has been empirically proved in many studies that resource rents negatively correlate with schooling (citation examples?).

Many studies also point to the positive relationship between happiness and education (see Blanchflower and Oswald, 2004; and Cunado and de Gracia, 2012). Education is said to provide an opportunity for self–improvement and broadening of one's interest and understanding of the social world. If this is so, then the reduction in education caused by natural resource rents would definitely reduce happiness. Resource rents are also linked to an increase in inequalities, especially to income inequality, through rent-seeking and institutional degradation mechanisms. This will, over time, increase grievances and hence reduce happiness. Finally, several studies also find a strong correlation between happiness and environmental quality (Ferrer-i-Carbonell and Gowdy, 2007).That is, a negative impact of resource rent on the environment will affect happiness. Thus, it can be claimed that the environmental impact of resource abundance can provide an explanation for the negative correlation between happiness and resource abundance.

2. Empirical Evidence

A series of empirical studies has been conducted in an attempt to examine the existence and the robustness of the natural resource curse and its transmission mechanism. However, in line with the divergence in the theoretical discourse, the outcomes of these studies were also rather different. Nonetheless, these studies could be classified into four main categories: the proxies used to measure the natural resource (resource abundance versus resource dependence); the type of analysis and data used (cross-section versus panel analysis); the nature of the resource itself (diffuse versus point resources); and the disciplinary and level differences (macro and meso levels versus micro level, and economic and political perspective versus the social and anthropological). In general, the majority of these studies support the validity of the resource curse thesis. In addition, the multi-dimensional discussion of the phenomenon reveals other aspects of the problem. This has highlighted the need for a more standardized approach that can take advantage of the crosscutting impacts of different methodologies and disciplines (Papyrakis and Gilberthrope, 2015).

2.1 Natural resource Abundance or Dependence

Empirically, researchers distinguish between resource abundance and resource dependence. The idea is that the impact of resource reserves is different from the flow of these resources when they are actually produced and enter into the economy. The per-capita natural resource capital is used to measure resource abundance, whereas the share of natural resources in export and GDP is the most commonly used measure for resource dependence. Sachs and Warner (1995) were the first to provide evidence for the negative association between resource dependence (measured by the ratio of natural resource exports in GDP) and economic growth in cross-country analysis during the period 1970-1990. Studies by Gylfason (1999, 2001) also support the negative impact of resource dependence (measured by the share of natural resources in the national wealth) on economic growth. Mehlum et al. (2006) examined resource dependence (measured by the share of natural resources in exports) on institutions. They argue that the nature of existing institutions plays a crucial role in the expected impact of these resources on the economy. They concluded that a combination of weak institutions and resource abundance will definitely decelerate economic growth. After addressing the natural resource curse in the Middle East and North Africa (MENA) for almost forty years, Arezki and Nabil (2012) show that resource dependence (measured by the share of natural capital in GDP) leads to low non-inclusive economic growth and high levels of economic volatility. In parallel, and with an emphasis on resource abundance, Apergis and Payne (2014) traced the impact of resource abundance (measured by oil reserves) on the economic growth of MENA countries for the period between 1990 and 2013. They point out that resource abundance has a negative impact on growth. They also argue that the high quality of institutions can actually minimize this negative consequence of oil reserves on real economy.

Contrary to the above discussion, these proxies of natural resources have been criticized for their inherent endogeneity that results in statistical biases. Moreover, Brunnschweiler and Bulte (2008) emphasize the importance of the natural resource proxy when they challenged the work of Sachs and Warner (1995). They advocate that the per capita income is a better measurement of resource dependence due to the endogeneity of the share of natural resources in GDP. They also argue that resource dependence has no correlation with growth and that resource abundance is positively correlated to economic growth. In the same vein, Stijns (2005) indicates that resource abundance (measured by mineral reserves) is not a significant structural determinant of economic growth.

2.2 Cross-Sectional vs Panel Analysis of the Curse

In other contexts, scholars of the natural resource curse distinguish between cross-sectional and panel analysis outcomes of empirical studies. However, the natural resources literature is dominated by cross-sectional studies, which provide strong

support to the thesis. Gylfason (2001) studied the impact of the share of natural capital in national wealth on education as a possible transmission of the natural resource curse. He used cross-sectional data from 65 countries for the period 1980-1997 and found that natural resources have an adverse impact on education, and, hence, can prevent economic growth in the long run. In addition, in a cross-sectional analysis of 103 countries, Atkinson and Hamilton (2003) argue that the share of natural resources rent in GDP is negatively correlated to savings. Moreover, using a cross-sectional analysis, Papyrakis (2007) found that natural resource dependence reduced investment, schooling, and openness in the United States of America for the period 1986-2001.

In contrast, Blanco and Grier (2012) used a cross-sectional data approach and a simultaneous model of human and physical capital accumulation of 17 Latin American countries. They claim that the assumption that natural resources reduce economic growth through its negative impact on physical and human capital accumulation has no significant empirical support. They also argue that the share of petroleum in exports has a positive impact on physical capital accumulation but a retrograde effect on human capital accumulation. Despite its dominance in the literature on the resource curse thesis, cross-sectional analysis has also been criticized for its inconsistency due to the fact that it does not control for countries fixed effect. And, as a solution for this limitation, many empirical investigations have been conducted using panel data with a country-fixed effect. The outcomes of these studies are also quite divergent. Korhonen et al. (2004) used data from 100 countries to study the impact of resources on economic growth in the existence of different political systems. Their study shows that the high dependency on resource revenues is associated with lower economic growth. Mehrara (2009), in a panel study of 13 oil exporting countries, found that there is a threshold between oil revenues and economic growth. He found that beyond these thresholds, oil revenues will have a negative impact on economic growth. He determines these thresholds at 18-19%.

Furthermore, in a panel data of 14 provinces of Kazakhstan, Oskenbayev and Karimov (2013) investigated the relationship between oil and gas resources and economic growth through the institutional mechanism. They found that the negative impact of natural resources is combined with institutional impact. Birdsall and and Hamoudi (2002) argue that the stagnancy of the Trade/GDP ratio as measurement of countries openness or closeness is misleading. This is because it systemically chooses resource-dependent countries. Hence, they concluded that a country's openness or closeness is perpendicular to economic growth. In their panel analysis, Lederman and Maloney (2003) found that resource abundance has a positive effect on economic growth, whereas export concentration hampers economic growth. Using panel data of 100 developed and developing countries, a study by Butkievicz and Yanikkaya (2010) showed that the mineral resource curse is provoked through weak institutions and low human capital accumulation. The study also showed that when the panel data is divided into developed and developing countries, the

resource curse holds only for developing countries. Using panel data between 1980 and 2003, Torres et al. (2012) found no significant relationship between oil concentration measured by oil rig productivity and economic growth.

2.3 Diffuse vs Point Resources

Empirical studies also indicate that the existence and severity of the natural resource curse depend on whether the resource is a diffuse or a point resource. This distinction refers back to Auty's (2000) staple trap model of the natural resource curse. However, Auty made use of Watkin's (1963) bipolar staple trap theory. The central discussion in the staple theory and its different versions is the external sector and its spill overs on to the local domestic economy. Later, Baldwin (1956) was the first to mention the staple trap in his discussion of a bipolar economy of plantation (cotton/sugar). In that discussion, he argued that the plantation sector does not have the ability to create socio-economic linkages, whereas the non-plantation (wheat) sector structurally has these back and forward linkages, which are prone to education and infrastructure. However, in his staple trap model of diffuse and point resources, Auty (2001a, 2001b) argues that point resource-rich countries are susceptible to predatory governments and factional politics, which promote sectional interests. The outcome of such governments is huge institutional damage that ultimately leads to policy distortions, undiversified economies, and growth collapse (Vahabi, 2017). The main explanation for this difference in outcomes is that diffuse resources, unlike point resources, have the ability to create and promote socio-economic linkages, which promote productive activities that lead to capital accumulation and enhances growth.

In contrast, point resources actually lack these linkages and instead have a distorting impact on the institutions, which leads eventually to growth collapse. Focusing on the geographical concentration of resources, Bulte et al. (2005) point out that point resources, excluding gems and gold, are typically associated with less productive social institutions. This is because of its geographical intensity, which makes it easier for small elites to control them at a very low cost. These elites will then become very resistant to economic reforms and industrialization since they will dilute their power. As a result, the modernization of these societies will be delayed and their development levels will be lowered. Ross (2004) linked point resources to civil strife by introducing a rent-seeking and conflicts models to study the contests of natural resources. His findings showed that point resources, which are abundant and geographically concentrated, are associated with civil strife and growth deceleration. He claims that point resources have the ability to intensify contests over resources that can lead to rent seeking or civil war, whereas diffuse resources do not. Auty (2000) amended his staple trap model to show that the damage of point resources is not only institutional but also fiscal. This is because point resources tend to increase the share of natural resources in domestic economy linkages, which, in

turn, increases government revenues and control. This leaves the economy vulnerable to policy failure and its damaging impact.

2.4 The Natural Resource Curse across Disciplines and Scales

Recently, Papyrakis and Gilberthorpe (2015) have probed into the empirical literature of the resource curse across disciplines and scales. They point out that empirical studies evolved in a fragmented fashion across economics, political economy and social disciplines as well as in micro (community), meso (regional) and macro (country) scales. This fragmentation has affected the outcomes of these different studies and provided a comprehensive discussion of the resource curse. The authors found that studies on the macro and meso levels were dominated by economists and political economy scholars, whereas studies on the micro level were dominated by social scientists and anthropologists. Early studies on the macro level supported the important role of resource abundance in achieving economic growth (see Lewis 1955; Rostow 1960 and Watkins 1963). The general conclusion of these studies provides strong evidence of the existence of the curse (Prebish and Singer, 1950). Many macro studies discuss the Dutch disease (see Neary and Cordon 1982; Krugman 1987; and Matsuyama 1992), and the general outcome of this literature is that the impact of the Dutch disease will depend on the learning-by-doing and spill-over effect across sectors. Other macro studies investigated institutions, with plenty of evidence being provided to support the negative impact of resources on institutions (see, Baggio and Papyrakis, 2010; Bulte et al., 2005 Isham et al., 2005 Leite and Weidmann, 2002 and Torvik, 2002). Several macro papers also focus on the impact of resources on democracy. The general conclusion of these studies is that resource abundance hinders the transition towards democracy (see Andersen and Ross, 2014; Andersen and Aslaksen, 2013; and Ross, 2001).

On the meso level, the focus was on cross-country and regional comparisons. Papyrakis and Gerlagh (2007) established that resource-rich states lagged behind with regards to long-term growth. James and Aadland (2011) found similar outcomes at a disaggregated county level. Papyrakis and Raveh (2014) showed that the resource-rich Canadian provinces suffer from inflationary pressures and reduced competitiveness. According to Papyrakis and Gilberthorpe (2015), the micro level is dominated by anthropologists. Studies at this level focus on the impact of resources on communities. They study how and why extraction activities generate particular outcomes such as poverty, gender inequalities and social fragmentation. The consensus argument within micro level studies is that the differences in the social, economic and cultural features which are embedded in each community determines whether this community will transfer its mineral wealth into a blessing or a curse (see, Filer, 1990).

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CHAPTER 3 HAPPINESS AND THE RESOURCE CURSE[14]

Abstract

There has been increasing interest in the so-called 'resource curse': the tendency of resource-rich countries to underperform in several socio-economic outcomes. More recently, several papers have looked beyond the traditional impact on economic growth and instead have focused on the effects upon broader human welfare indicators. A separate empirical literature in recent decades has probed into the determinants of happiness and subjective well-being (using either country or household data). Our paper contributes to the literature by bringing these two empirical strands of research together. This is the first study, to our knowledge, that makes use of a large panel dataset to explore the links between changes in happiness across countries and several measures of resource wealth. Consistent with prior empirical evidence of a resource curse in oil-rich nations, we find that oil rents are negatively linked to improvements in happiness over time. This happiness 'resource curse' curse appears to be oil-specific and holds both for the levels as well as changes in happiness.

Keywords: *Resource curse · Mining · Happiness · Cross-country analysis*

1. Introduction

In recent years, there has been a burgeoning literature researching the links between resource abundance and several measures of economic performance. Much of the so-called resource curse literature has developed theoretical and empirical research explaining the negative correlation observed between several measures of mineral wealth and long-term economic growth (Baggio and Papyrakis 2010; Murshed and Serino, 2011; Papyrakis, 2014). Much of this literature (to which this paper belongs) pays particular attention to oil and its correlates[15].

While the resource curse literature initially focused attention on economic growth, it gradually widened its scope to broader welfare variables. For example, Bulte et al. (2005) and Daniele (2011) claimed that mineral resource rents are associated with lower values of the Human Development Index (a composite development index of life expectancy, education and GDP per capita), undernourishment, higher child mortality, and limited access to safe water. Deaton and Niman (2012) and Pegg (2006) provide evidence of a poor empirical

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15E.g. for the case of economic growth, see Khanna (2017), conflict, see Lujala (2010), gender and broader income inequality, see Ross (2008) and Parcero and Papyrakis (2016), bureaucratic efficiency, see Goldberg et al. (2008).

track record of poverty alleviation in mineral-dependent economies. Several papers in the field of ecological economics have also linked mineral wealth to low scores of sustainable development indices (such as the genuine savings and genuine income measurements; see Atkinson and Hamilton, 2003; Dietz and Neumayer, 2007).

In parallel (but regrettably independently), a separate empirical literature in recent decades has probed into the determinants of happiness and subjective well-being (using either country or household data). Several of these papers examine the importance of absolute, relative, and past income in explaining variations in reported happiness (see Asadullah et al., 2018; Clark et al., 2008). Some of them are in support of the so-called *Easterlin paradox*, suggesting that increasing average income (at the country level) yields diminishing marginal gains in average happiness (Blanchflower and Oswald, 2004; Easterlin and Angelescu, 2012; di Tella and MacCulloch, 2008). Several other socio-economic and environmental factors appear to explain variation in reported happiness (e.g., unemployment and inflation, see di Tella et al., 2001; education levels, see Caner, 2016; corruption, see Welsch 2008; trade, see Hessami, 2011; and environmental quality, see Ferrer-i-Carbonell and Gowdy, 2007).

To date, there has been no attempt to bring these two empirical traditions of research together and explore whether resource-rich countries find it more difficult, other things being equal, to translate their resource wealth into happiness gains (i.e. a '*happiness resource curse*'). Our paper contributes to the literature by bringing these two empirical streams of research together. This is the first study to our knowledge that makes use of a large panel dataset to explore the links between changes in happiness across countries and several measures of resource wealth. Consistent with prior empirical evidence of a resource curse in oil-rich nations, we find that oil rents are negatively linked to improvements in happiness over time. This happiness 'resource curse' curse appears to be oil-specific and holds both for the levels as well as the changes in happiness.

Section 2 consists of a theoretical note on happiness and the resource curse that can serve as a formal framework of analysis for subsequent chapters. Section 3 provides a brief literature review on happiness and its correlates (with an emphasis on the role of natural resource rents). Sections 2 and 3 together provide the justification behind the empirical specifications that are tested in subsequent sections. Section 4 is devoted to our empirical analysis on happiness changes and resource wealth, where we disaggregate the analysis per type of natural resource (abundance/dependence) measure. In Section 5 we extend our analysis by looking at how happiness levels (rather than changes over time) correlate with our measures of resource affluence. Section 6 summarises our main findings and offers concluding remarks.

2. A Theoretical Note on Happiness and the Resource Curse

The microeconomic literature on happiness focuses on the utility of an individual household. Following Clarke et al. (2008) and Layard, (1980), this utility can be summarised as largely depending positively on four variables: individual consumption (related to household income) but at the usual diminishing rates, the household's income relative to the average or mean income in society, expected future income, and leisure. This theoretical framework also assumes that there is some happiness adaptation to income gains: individuals become accustomed to higher income and consumption levels, and the consequent rise in happiness tends to diminish after the initial periods.

Moving on to a more aggregative view of happiness (which involves summing individual utilities in one country and arriving at some utilitarian welfare function, and then making the same comparison across countries) entails a number of steps and simplifications, particularly to carry out empirical investigation. Measured national average utility levels are expected to positively correlate with average per-capita income (GDP) levels. Growth in per-capita income captures expected improvements in average income over time (which helps offset the aforementioned adaptation effect). The relative income variable may explain a large part of the variation in utility levels across individuals (as a result of the status associated with higher income levels with respect to others), but it is less likely to do so at the more aggregate country level (the higher status of any individual gives rise to a lower status for all the rest in the economy, leading hence to a 'zero-sum game' on the whole, see Clark et al., 2008, p. 101). Nevertheless, there might be an aggregate negative correlation between income inequality (e.g. the Gini coefficient) and average utility if, on average, individuals tend to have a preference for more egalitarian societies (Baggio and Papyrakis, 2014). As discussed earlier, individual valuation of labour could then be replaced by societal (and individual) distaste for unemployment. We could further add utility from public goods, as in the case of educational expenditure.

Across countries, happiness may also vary along with differences in institutions, e.g., by variations in the rule of law, by control of corruption, and by the degree of democracy. Firstly, resource dependent countries are deemed to have poorer institutions relative to less resource dependent nations, causing their citizens to be less happy on average. Secondly, expected income can fluctuate considerably along with commodity price volatility, especially in the case of oil prices. Thirdly, resource windfall gains and temporary increases in income may create few happiness gains to the extent that short-sighted governments in mineral-rich contexts do not aim for an equitable distribution of rents and investment in productive capacity. Natural resource booms and discoveries can create short-term income shocks with corresponding happiness gains; however, these can only be sustained temporarily if resource-rich economies underperform in the long run (as is often the case). Fourthly, although the happiness measure is an average for

a nation based on representative surveys, the response rate to these surveys may be biased towards median individuals, who in the case of resource rich countries may be experiencing a relative decline in income compared to mean or per-capita income changes. This will occur with a greater concentration of wealth at the top, which is more likely in resource rich countries with poor institutional constraints and structures. Finally, resource-dependent economies tend to be less diversified with exports dominated by primary commodities; as a result, employment in the traded sectors is lower than in more diversified economies, accompanied by the forward and backward linkages to employment in other sectors.

Thus, we may write a happiness function (H) as a function of several arguments:

$$H = f(Y, G, I, P, W, R/Y),$$

where Y is the level of per-capita income, G is growth of income per capita, I refers to institutional quality, P stands for public goods, W stands for work or employment, and the last argument, R/Y, is a measure of resource dependence. Happiness is expected to vary positively with all the arguments in the function above, with the exception of resource dependence. Some of the right-hand side arguments may also correlate with one another to some extent (e.g. richer economies may be able to afford better institutions and invest more in public good provisions). In addition, mineral resources may affect growth prospects or institutional development in accordance with the resource curse hypothesis—these endogeneity issues will be discussed in the empirical Section 4.

3. Happiness and the Resource Curse: A Brief Literature Review

In this section, we discuss the mechanisms that are likely to link happiness to resource rents as well as other possible explanatory factors.[16] The theoretical mechanisms presented will then shape the specifications that will be empirically tested in Sections 4 and 5 of the paper.

3.1 Happiness and Resource Wealth

Resource rents may, in principle, be associated with larger happiness gains if the revenues become redistributed equitably and become invested in activities that enhance welfare (e.g. large public investment projects). On the other hand, it is likely that oil rich nations, in particular, fail to translate their resource wealth into increased happiness for the same reasons that often prevent them from experiencing faster economic growth. Some of these reasons may simply relate to how petro-state economies typically function; oil rents might fail to support happiness gains over time whenever they generally disadvantage activities in the non-oil sectors via Dutch disease effects (where the majority of job opportunities

[16] For some excellent and more detailed reviews of the literature, see Radcliffe (2013), Weimann et al. (2015).

are located; e.g. see Beine et al., 2012). Similarly, oil enclaves might create few spill-overs to the rest of the economy (often as a result of their geographical clustering, either offshore or in a few remote places onshore, e.g. see Auty, 2006). In addition, changes in happiness may simply be influenced by the inability of many oil-rich countries to raise living standards or by the macroeconomic volatility experienced as a result of fluctuating oil prices (see van der Ploeg and Poelhekke, 2009).

A general feeling of dissatisfaction might also arise as a result of bad governance (a typical feature of many mineral rich economies) and the corresponding inefficient allocation of public revenues (based on rent-seeking rather than expected returns; Brollo et al., 2013). Oil rich countries are often characterised by weak rule of law and by a high risk of expropriation, malfunctioning bureaucracies and endemic corruption (see Kolstad and Wiig, 2009). The geographic clustering of mineral resource also intensifies (often pre-existing) power struggles and grievances across different interest groups (which are often divided across ethnic/religious lines; see Baggio and Papyrakis, 2010; Hodler, 2006). Furthermore, the limited democratic accountability typically found in authoritarian oil-rich states can further enhance the general dissatisfaction arising from the mismanagement of mineral rents and public resources more broadly (Tsui, 2011).

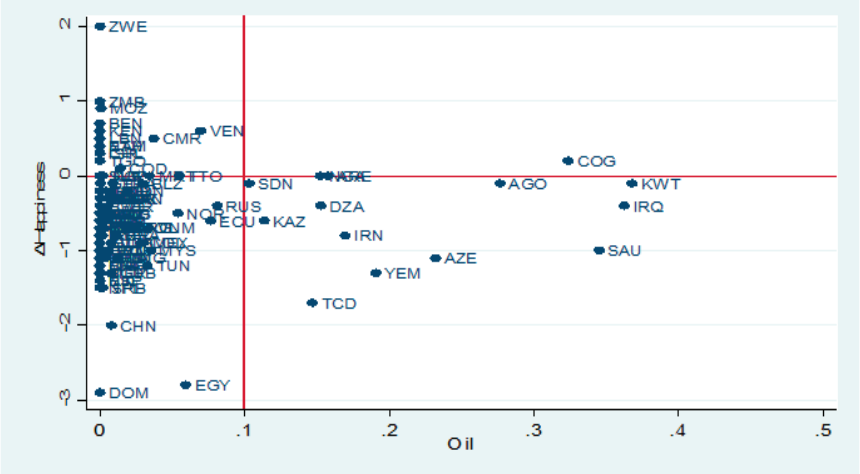

Figure 1 Changes in happiness and oil dependence. Note: Abbreviations correspond to 3-letter country ISO codes

Figure 1 presents a scatterplot linking changes in reported happiness (between 2009 and 2012) to the initial level of oil dependence. Happiness is proxied by the Gallup World Poll measure of average subjective well-being (a measure of average reported satisfaction with life of the residents of each country, with scale from 0 to 10; see Gallup World Poll 2017). Oil dependence is measured as the share of oil rents in GDP (data provided by the World Bank 2016). Changes in negative happiness characterise both oil rich and scarce economies; however, for high levels of oil dependency (where oil accounts for more than 10% of GDP), there is a much larger proportion of countries experiencing a negative change (please note that the horizontal red line now corresponds to no change in happiness—the vertical red line denotes a level of oil dependence equal to 10%).

3.2 Happiness and Income

Several empirical analyses argue that increased income does indeed 'buy happiness', although at a diminishing rate: there is a positive but concave relationship between happiness proxies and average income (Blanchflower and Oswald, 2004; Easterlin and Angelescu, 2012; di Tella and MacCulloch, 2008). This is in line with the so-called *Easterlin paradox*, suggesting that the relationship between happiness and average income flattens out for sufficiently high levels of economic development (see Easterlin 1974, 2015). Economic growth, hence, results in happiness gains primarily for low-income countries, where improvements in income levels allows access to some of the basic necessities of life (FitzRoy et al., 2012). In addition, while individuals tend to be also concerned about their relative income, this status return from having higher income with respect to a reference group has little impact on country-level happiness over time. Individuals also tend to quickly adjust to increased income levels; in other words, there is an adaptation/habituation effect, where any positive happiness effects of increases in income tend to fade away over time (di Tella et al., 2010).

3.3 Other Correlates

Several studies provide empirical support to a strong negative correlation between happiness and *unemployment* (as a result of the associated insecurity and anxiety that job-loss brings about; see Blanchflower et al., 2014). Other things being equal, unemployed individuals tend to experience reduced life-satisfaction scores by approximately 5–20% (Di Tella et al., 2001; Lelkes, 2006). There is also evidence suggesting that unemployment has a persistent effect on happiness (i.e. it does not decline with the length of unemployment; see Knabe and Rätzel, 2011).

There is also some tentative evidence pointing to a positive relationship between *education* and happiness (Blanchflower and Oswald, 2004; Cuñado and de Gracia 2012). For many, education has an intrinsic value since it provides an opportunity

for self-improvement and broadening one's interests and understanding of the social world. Some studies, though, find no significant effect of education on happiness (e.g. Flouri, 2004) or even a negative one (Caner, 2016). This might be explained by the fact that education often correlates positively with income levels as well as (often) unfulfilled income aspirations. As a result, controlling for income levels might make any positive significant statistical relationship between education and happiness disappear (see Graham and Pettinato, 2001).

Several studies claim that *inflation* can potentially reduce happiness—individuals tend to dislike inflation because of the ensuing uncertainty regarding changes in the cost of living and real income (see Shiller, 1997). In general, studies find that unemployment tends to be much more harmful than inflation in terms of happiness losses (e.g. see Di Tella et al., 2001, 2003), although there seems to be no significant effect when one uses aggregate country data (see Bjørnskov, 2003 and Ovaska and Takashima, 2006). There is also some ambiguity regarding the relationship between *trade* openness and average happiness. While trade expansion has the potential for job creation and lower prices, efforts for freer trade worldwide often face stiff resistance as a result of fear of displacement of domestic workers and closure of local industries. Many studies, hence, find a negative relationship between measures of trade openness and changes in happiness (e.g. di Tella and MacCulloch, 2008; Hessami, 2011; Ovaska and Takashima, 2006).

Several scholars claim that *environmental problems* have a detrimental effect on happiness—individuals tend to value the local and global ecosystem services provided by natural habitats (Ferrer-i-Carbonell and Gowdy, 2007; Li et al., 2014). Other things being equal, those living in polluted areas tend to report lower scores of subjective well-being (see Ferreira et al., 2013). There is also some evidence suggesting a positive link between transparency and happiness. Trust in public institutions, the legal system, and the government is also associated with higher happiness levels (Hudson, 2006). Most individuals express preference for a strong *rule of law* system that shields against meritocracy and prevents inefficiency, unfairness, and criminal activity (Tavits, 2008).

4. Happiness and the Resource Curse: Regression Analysis

4.1 Data and Estimation

In this section, we examine the dependence of changes in happiness on natural resource wealth as well as on a vector of other explanatory variables that have been found to be significant happiness correlates in the literature. We are especially interested in the sign of the correlation between our measures of natural resources and happiness (given the large evidence in the resource curse literature pointing to inferior development outcomes particularly in mineral rich economies; Gilberthorpe and Papyrakis, 2015; Ross, 2015). It is also of interest to explore

whether there is a differentiated impact of different types of natural resources on happiness changes—several studies have suggested that point resources (oil, other minerals) are more strongly associated with inferior development outcomes than diffuse resources (agriculture), e.g. see Bulte et al. (2005), Boschini et al. (2013) and Lederman and Maloney (2007)[17]. To identify the dependence of changes in happiness on different natural resource measures, we estimate a series of cross-country panel regressions. For the purposes of our analysis, the following empirical specification is estimated:

$$\Delta\ Happiness_{it} = \alpha_0 + \alpha_1 Resource\ Dependence_{i(t-1)} + \alpha_2 z_{i(t-1)} + u_i + \varepsilon_{it} \qquad (1)$$

where Δ Happiness corresponds to changes in happiness for country i at time t, Resource Dependence(t−1) refers to the value of each natural resource sector in total economic activity (in the previous year). $z_{i(t-1)}$ corresponds to the vector of (1-year lagged) control variables found to explain variation in happiness across countries in the literature (e.g., income per capita, economic growth, unemployment, education; see Sect. 2), and u_i and ε_{it} are the country-specific (time-invariant) and variable components of the error term respectively[18]. Our panel data analysis covers the 2000–2012 period.

We opt for a random effects estimation given that this leads to more efficient parameter estimates for variables exhibiting limited time variation (as is the case for a number of our happiness determinants, e.g. the indices of resource dependence, education, corruption and income per capita. For a more detailed discussion of these issues, see Hsiao, 2007; Neumayer, 2004; Wooldridge, 2010. Random effects explore both the between and within country variation (while fixed effects focus only on the latter). The standard errors of variables that fluctuate little over time typically become inflated in the case of fixed-effects estimators. This is not surprising given that fixed-effects estimations involve 'time demeaning' variables to remove time-invariant observables (and as a result, time invariant variables drop out in fixed-effects regressions, while variables with limited time fluctuation typically become statistically insignificant). A recent example is the analysis by Corrigan (2014), who demonstrates how regressors typically found to be significant determinants of institutional quality (income per

[17] This is likely to be attributed to the geographical concentration and appropriability of different resource types (which tend to be high for the oil industry).

[18] "Appendix 1" lists countries in the sample (for the richer oil specification of Table 1). "Appendix 2" presents a correlation matrix for all regressors and "Appendix 3" provides variable descriptions and data sources. Descriptive statistics are presented in "Appendix 4".

capita and democracy) become statistically insignificant in a fixed-effects setting[19]. In the same vein, when we replicate our random-effects estimations using fixed-effects most variables lose statistical significance (and typically our random-effects estimations are closer to the pooled-OLS estimations given the larger variation across space than time)[20].

Table 1 Changes in happiness and natural resource dependence

Dependent variable	ΔHappiness (1)	ΔHappiness (2)	ΔHappiness (3)	ΔHappiness (4)	ΔHappiness (5)
Constant	− 0.09	− 0.58	0.27	0.15	− 0.09
Happiness (t − 1)	− 0.41***	−0.57***	− 0.62***	− 0.69***	− 0.70***
	(0.04)	(0.05)	(0.05)	(0.05)	(0.05)
Oil dependence	− 0.62*	− 0.83*	− 0.99*		
	(0.36)	(0.49)	(0.54)		
Mineral dependence				0.72 (1.09)	
Agricultural dependence					-0.35 (0.61)
Income pc	0.28*** (0.03)	− 0.83* (0.49)	0.44*** (0.05)		0.47*** (0.06)
Growth		1.35*** (0.39)	1.32** (0.61)	1.30** (0.56)	1.44** (0.57)
Unemployment			− 2.03*** (0.78)	− 2.07*** (0.56)	− 2.18*** (0.71)
Education			− 0.74 (2.01)	0.45 (2.25)	− 0.34 (2.24)
R^2 overall (within; between)	0.37 (0.56; 0.11)	0.40 (0.69;0.22)	0.43 (0.69;0.20)	0.41 (0.72; 0.19)	0.41 (0.73; 0.20)
Countries	126	121	118	136	130
N	437	322	296	333	321

Robust standard errors of coefficients in parentheses. Time dummies included in all specifications
*, **, *** correspond to a 10, 5 and 1% level of significance

4.2 Results and Discussion

We present our empirical estimations in Table 1. Our dependent variable (*ΔHappiness*) measures the change in average reported happiness (between

[19] There are also several critiques of the Hausman test (as a means to choose between random and fixed effects estimators) in cases of variables exhibiting little variation over time (Baltagi 2011, p. 321; Clark and Linzer 2015).

[20] Results available from the authors upon request.

2000–2003, 2003–2006, 2006–2009 and 2009–2012). Happiness is proxied by the Gallup World Poll measure of average subjective well-being (a measure of average reported satisfaction with life of the residents of each country, with a scale from 0 to 10—larger values correspond to higher levels of happiness (see Gallup World Poll 2017). This is one of the most comprehensible and widely used proxies of cross-country variation in happiness- based extensive opinion surveys (see Deaton, 2008; Stevenson and Wolfers, 2013). In all regressions we add the initial level of happiness (for the beginning of each period, i.e. $Happiness_{(t-1)}$), given that happiness gains are expected to be smaller for countries with high initial happiness levels (given that the happiness index has an upper bound). In Column (1), we add *Oil Dependence* (measured by oil rents as a share of GDP) and income per capita (*Income pc*) as additional explanatory variables (data provided by the World Bank 2016). We find evidence of an oil-happiness resource curse (significance at the 10% level)—a 100% difference in the share of oil rents in GDP is associated with a 0.62 unit drop in the happiness index (over each 3-year period). This holds when controlling for the initial level of happiness and income per capita (with the latter being positively and significantly associated with changes in happiness, as suggested by the literature (see di Tella and MacCulloch, 2008). This is an effect of substantial magnitude, given that the − 0.62 coefficient of oil dependence refers to effects over a single 3-year period, that can cumulatively make a large difference over time. For example, a difference in oil dependency equal to 60% (which is about the size of the actual difference between the least and most oil-dependent economies in our sample) that persists across all 4 sub-periods is associated with a happiness loss of approximately (0.62 ×0.60×4) one and a half happiness units over the entire 12-year period[21].

In Column (2) of Table 1, we enrich our specification by adding the corresponding *growth* rate of GDP per capita for each period. The oil-happiness resource curse persists, while we also find that both the level and growth of per capita income are positively and significantly linked to happiness gains[22]. In Column (3), we also add the *unemployment* rate and the share of educational expenditure in GDP (variable: *education*) as additional regressors (data available from the International Labour Organization, 2016 and the United Nations, 2016, respectively). In line with earlier studies, we find unemployment to correlate negatively with changes in happiness (Blanchflower et al., 2014). On the other hand, the effect of education appears to be statistically insignificant (something

[21] It is unlikely that the direction of causality runs from happiness to oil dependence, given that the latter is to a large extent the result of geographical factors and long-run investment in the extractive sector (which is also confirmed by a series of performed Granger causality tests).

[22] This is in line with the so-called adaptation/habituation effect; faster growth can compensate for the fact that individuals tend to quickly adjust to increased income levels, di Tella et al. (2010).

that has been also observed in other studies (e.g. in Caner, 2016; Flouri, 2004). All earlier results hold and the oil-happiness resource curse appears to be slightly stronger. A 100% difference in the share of oil rents in GDP is now associated with a 0.99 unit drop in the happiness index.

Columns (4) and (5) replicate the richer specification of Column (3) in the case of mineral and agricultural dependence, respectively. *Mineral dependence* is measured as the share of non-petroleum mineral rents (e.g. from coal, gas, oil, tin, gold, lead, zinc, iron, copper, nickel, silver, bauxite, phosphate) in GDP (data provided by the World Bank, 2016). *Agricultural dependence* is captured by the equivalent measure for agricultural production (data by the World Bank, 2016). The happiness 'resource curse' curse appears to be oil-specific—the corresponding coefficients of non-petroleum minerals and agriculture are both non-significant (positive and negative respectively). This is also in line with other papers in the resource curse literature that place particular emphasis on the negative development effects of oil (see Sect. 3).

Table 2 checks for the stability of the oil-happiness resource curse by replicating the richer oil specification (Column (3) of Table 1) by first dropping the educational variable (which was insignificant) and then introducing in alternate order some of the other happiness determinants discussed in Sect. 3 (please note, that alternative combinations of these regressors have no effect on the presence of a statistically-significant oil-happiness link; results are available from the authors upon request). In Columns (6,) (7), (8,) and (9), we introduce variables capturing *inflation*, *trade* openness (the value of imports and exports in GDP), environmental quality (measured by the extent of carbon dioxide damage in national income[23] the corresponding variable CO_2 can be perceived as a measure of the carbon intensity of production as well as of air quality), and *rule of law* (measured by the corresponding World Governance Indicators index in the range of − 2.5 to 2.5, where higher values correspond to better performance in rule of law))[24]. With the exception of trade, the other control variables are statistically insignificant once controlling for other country characteristics (the negative and significant trade coefficients are in line with findings from other empirical studies, e.g. Hessami, 2011; Ovaska and Takashima, 2006). More importantly, all regressions of Table 2 point to a negative link between oil dependence and happiness gains, of similar size to the one identified in Table 1[25].

[23] The World Bank estimates this at $20 per ton of carbon times the number of tons of CO_2 emitted

[24] Data for the inflation, trade and CO_2 variables are available by the World Bank (2016). The source for the rule of law data is WGI (2016).

[25] Replicating Columns (4) and (5) of Table 1 (mineral and agricultural dependence) by introducing the same additional regressors, does not change the earlier finding of an oil-specific happiness curse.

Table 2 Changes in happiness and oil dependence (alternative regressors)

Dependent variable	ΔHappiness (6)	ΔHappiness (7)	ΔHappiness (8)	ΔHappiness (9)
Constant	0.20	0.23	0.27	− 0.45
Happiness (t − 1)	− 0.62***	− 0.61***	− 0.63***	− 0.60***
	(0.05)	(0.05)	(0.05)	(0.05)
Oil dependence	− 0.91*	− 0.90* (0.50)	− 0.91* (0.53)	− 1.24* (0.59)
	(0.52)			
Income pc	0.44***	0.44***	0.44***	0.51***
	(0.05)	(0.05)	(0.05)	(0.07)
Growth	1.33**	1.39**	1.40**	1.40**
	(0.52)	(0.56)	(0.57)	(0.55)
Unemployment	− 1.94***	− 1.98***	− 2.10***	− 1.95***
	(0.73)	(0.74)	(0.73)	(0.71)
Inflation	0.19			
Trade		− 0.12*		
CO_2			− 0.07	
Rule of law				−0.14
				(0.09)
R^2 overall (within; between)	0.43	0.43	0.43	0.68
	(0.69;0.21)	(0.69;0.22	(0.69;0.20)	(0.23;0.43)
Countries	121	120	121	121
N	301	299	301	301

Robust standard errors of coefficients in parentheses. Time dummies included in all specifications

*, **, *** correspond to a 10, 5 and 1% level of significance

4.2.1 Resource Abundance

Following Brunnschweiler and Bulte (2008), scholars working on the development effects of natural resources typically make a distinction between 'resource dependence' and 'resource abundance' measures. The former expresses the value of resources in relation to another economic activity (for instance, exports, total income etc.). The latter expresses values in terms of a non-economic exogenous variable (e.g. population or land surface) that is unlikely to be determined by natural wealth, at least in the short term. A number of econometric explorations of the resource curse find that this distinction disappears when expressing mineral values in per capita terms (see, for instance, Kropf, 2010; Brunnschweiler and Bulte, 2008; Cavalcanti et al., 2011). Resource-dependence measures tend to correlate more highly to the resource curse phenomena, given that they capture more accurately how important the resource sector is relative to the rest of the economy[26]. To do justice to this stream of the literature, we replicate the richer

[26]Resource abundant economies, instead, might not necessarily be highly resource-dependent (and therefore vulnerable to macroeconomic shocks and rent-seeking).

specifications in Columns (3)–(5) of Table 1 (for the case of oil, minerals and agriculture) by using the equivalent measures of resource abundance -- that is, the natural logarithm of oil, mineral and agricultural rents in per capita terms (see Table 3).

In line with earlier findings from this stream of the literature, we also observe that the happiness-resource curse disappears in the case of oil abundant (but not necessarily dependent) economies, while it even turns into a blessing for the mineral and agricultural abundant ones [significant at the 10% level, see Columns (11) and (12)].

4.2.2 Non-linear Resource Effects

In Table 4, we examine the presence of a non-linear relationship between the different measures of resource dependence and changes in happiness—Columns (13)–(15) repeat the specifications found in Columns (3)–(5) of Table 1 after incorporating a quadratic term for each of our resource dependence measures. As previously, we only find evidence of a resource-happiness curse for the case of oil dependence, but the results now also suggest that oil dependence links to happiness losses only above a specific threshold level (which, though, tends to be quite low -- close to 13%). In other words, oil rents have the potential to increase happiness but, as a whole, the relationship turns negative at relatively low levels of oil dependency.

4.2.3 Growth-Income Interaction

Table 5 introduces a growth-income interaction term in our key specifications [Columns (3)–(5) of Table 1]. In effect, this tests the so-called Easterlin Paradox (Easterlin, 2015), which hypothesises that economic growth yields smaller happiness increments above a certain level of economic development. Indeed, we find some evidence in support of the paradox: economic growth translates into happiness gains for countries with a GDP per capita level below approximately $37,000. This is, however, a relatively high threshold level (equivalent to the GDP per capita found in advanced economies, such as the UK and Germany), with few countries exceeding this income level[27]. Most significantly, there is no change to the oil-specific happiness-resource curse that we identified in earlier regressions.

[27]For a correct interpretation, one needs to keep in mind that there is also a positive indirect effect of growth on happiness changes going through the income per capita variable.

4.2.4 Endogeneity Issues and Some Additional Robustness Checks

Several of the happiness explanatory variables might be endogenous and dependent on either income levels or natural resource dependence. Natural resource booms and discoveries may, for instance, raise income per capita levels in the short run but negatively affect economic growth or institutions in the longer term (in accordance with the resource curse hypothesis). For this reason, we run a series of two-stage least squares regressions lines: in the first stage, potentially endogenous variables are initially regressed on exogenous instrumental variables (including other covariates appearing in the equation of interest), while in the second stage the endogenous variables are replaced with their first-stage predicted values. We make use of two variables as instruments: one, proximity to the tropics captured by *latitude* (data by Hall and Jones, 1999) and the other, the extent of *ethnic fractionalisation* of the population (data by Montalvo and Reynal-Querol, 2005; the index takes values between 0 and 1 with lower scores corresponding to more ethnically homogenous societies). Both variables have been extensively used in empirical cross-country analysis as proxies that can address the possible endogeneity of several intermediate variables. For example, for the use of latitude as an instrument for income per capita and institutions, see Angeles and Neanidis, 2015 and Cooray and Schneider, 2016; for the use of ethnic fractionalisation as an instrument for income per capita and institutions, see Faria and Montesinos 2009 and Mauro, 1995.

Table 6 replicates Column (3) of Table 1 in a two-stage least squares setting for alternative endogenous variables. In Columns (19) and (20), we use latitude and ethnic fractionalisation to instrument for income per capita and growth, respectively. The coefficient of oil dependence (in the happiness regression) is of similar size and remains statistically significant at the 5% level, suggesting that the relationship between oil and happiness is robust and statistically significant even when addressing the potential endogeneity of income per capita and growth. In Columns (21)–(24), we consecutively include four additional regressors in our main happiness specification (the Gini coefficient of income inequality, democracy, government effectiveness, and control of corruption), which also become instrumented with latitude and ethnic fractionalisation. These aim to check whether oil dependence may influence changes in happiness primarily via eroding democratic accountability and institutional quality (or creating fewer egalitarian societies). The coefficient of oil dependence (for the happiness regressions) remains statistically significant.

Although the primary focus is on the second stage (i.e. the link between changes in happiness on oil dependence), it is worth briefly mentioning some key results from the first- stage regressions. Oil dependence appears to augment income per capita [Column (19)], to reduce income inequality [Column (21)], to hamper democracy [Column (22)] and to decrease institutional quality (Columns 23–24). However, as mentioned above, the coefficient of oil in the second-stage of happiness regressions remains consistently statistically significant (suggesting,

hence, that the effect of oil dependence on happiness losses cannot be attributed, at least primarily, to its indirect links with other explanatory variables).

Furthermore, Table 7 provides some further robustness checks regarding the link between changes in happiness and oil dependence. Columns (25) and (26) repeat Column (3) of Table 1 but now separately for developing and developed economies (using a GDP per capita level of $12,000 as the threshold level). The negative effect of oil dependence appears to be much stronger in the case of developing economies. We also find similar evidence for the countries located in the tropics (i.e. those countries located 23.5 degrees north/south of the Equator). Column (28) focuses on the years of the global financial crisis (hence, only the latest two subperiods of analysis: 2006–2009 and 2009–2012) in which the negative effect of oil dependence on happiness is stronger during this period (the coefficient is about half the size in the two preceding periods)[28]. Controlling for exchange rate movements (namely the devaluation of local currency against the US dollar) also does not significantly influence the oil coefficient [see Column (29)].

Table 3 Changes in happiness and natural resource abundance

Dependent variable	ΔHappiness (10)	ΔHappiness (11)	ΔHappiness (12)
Constant	0.20	0.13	− 0.68
Happiness (t − 1)	− 0.62***	− 0.69***	− 0.70***
	(0.05)	(0.05)	(0.05)
Oil abundance	0.004		
Mineral abundance		0.02**	
Agricultural abundance			0.11**
			(0.05)
Income pc	0.44***	0.49***	0.47***
	(0.05)	(0.05)	(0.06)
Growth	1.26**	1.25**	1.43***
	(0.62)	(0.56)	(0.57)
Unemployment	− 1.99***	− 2.32***	− 2.13***
	(0.75)	(0.64)	(0.64)
Education	−0.20	0.29	−0.32
	(2.00)	(2.10)	(2.12)
R^2 overall (within; between)	0.42 (0.67; 0.19)	0.41 (0.73; 0.19)	0.42 (0.73; 0.20)
Countries	118	136	130
N	296	333	321

Robust standard errors of coefficients in parentheses. Time dummies included in all specifications

*, **, *** correspond to a 10, 5 and 1% level of significance

[28] Results available from the authors upon request.

4.3 A Synthesis of Results

Our research aims to investigate the links between changes in happiness across countries and several measures of resource wealth. We find evidence of an oil-happiness-resource curse link; countries with economies largely dependent on oil find it harder to improve the average happiness levels of their citizens over time (Tables 1, 2). A heavy reliance on other minerals or agriculture, however, has no statistically significant effect on changes in happiness (Table 1). We also find that it is the relative importance of the oil sector in the economy that matters—when oil rents are expressed in per capita terms (rather than as a share of GDP), the oil-happiness resource curse disappears (Table 3). In addition, our results suggest that oil dependence links to happiness losses only when oil rents account for more than 13% of GDP; it is only when economies rely excessively on the oil industry that countries fail to improve the average happiness levels (Table 4).

Table 4 Changes in happiness and natural resource dependence (quadratic terms)

Dependent variable	ΔHappiness (13)	ΔHappiness (14)	ΔHappiness (15)
Constant	0.12	0.15	− 0.23
Happiness (t − 1)	− 0.60***	− 0.69***	− 0.72***
	(0.05)	(0.05)	(0.05)
Oil dependence	1.63*		
Oil dependence squared	− 6.26**		
Mineral dependence		1.17	
Mineral dependence squared		− 2.32	
Agricultural dependence			1.97
			(2.02)
Agricultural dependence squared			− 3.96
			(2.92)
Income pc	0.44***	0.49***	0.54***
	(0.05)	(0.05)	(0.08)
Growth	1.37**	1.30**	1.39**
	(0.59)	(0.56)	(0.59)
Unemployment	− 2.06***	− 2.07***	− 2.22***
	(0.72)	(0.57)	(0.68)
Education	− 0.36	0.43	− 0.27
	(1.98)	(2.22)	(2.17)
R^2 overall (within; between)	0.44	0.41	0.42
	(0.67; 0.24)	(0.72; 0.19)	(0.73; 0.20)
Countries	118	136	130
N	296	333	321

Robust standard errors of coefficients in parentheses. Time dummies included in all specifications

*, **, *** correspond to a 10, 5 and 1% level of significance

Our analysis also points to the significant role of other variables in explaining improvements in happiness across countries. Richer and fast-growing economies

find it easier to improve average happiness levels (Tables 1, 2, 3 and 4). However, there is evidence of a non-linear effect, with economic growth supporting happiness gains only for countries with a GDP per capita level below approximately $37,000 (Table 5). Non-resource variables may be endogenous (and affected by other explanatory variables); instrumental variable techniques, however, still verify that oil dependence is negatively associated with changes in happiness (Table 6). In addition, the oil-happiness link appears to be stronger in the case of developing economies (Table7). This robust evidence of an oil- specific happiness curse provides support to the theoretical rationale put forth in Sect. 2 of the paper; oil-dependent economies may find it more difficult, other things being equal, to translate resource rents into happiness gains. This effect is likely to be the combined result of overall macroeconomic mismanagement, poor institutions, limited economic diversification, increased exposure to price shocks and volatility, and an unequal distribution of revenues from the extractive sector.

Table 5 Changes in happiness and resource dependence (growth-income interaction term)

Dependent variable	ΔHappiness (16)	ΔHappiness (17)	ΔHappiness (18)
Constant	0.02	− 0.10	0.38
Happiness (t − 1)	− 0.62***	− 0.69***	− 0.70***
	(0.05)	(0.05)	(0.05)
Oil dependence	− 0.92*		
Minerals		0.82	
Agriculture			− 0.69
			(0.65)
Income pc	0.46***	0.52***	0.48***
	(0.06)	(0.05)	(0.06)
Growth	6.11*	6.58**	7.99***
	(3.35)	(2.81)	(2.75)
Growth * income pc	− 0.58*	− 0.65**	− 0.81**
	(0.37)	(0.32)	(0.32)
Unemployment	− 1.82**	− 1.84***	− 2.01***
	(0.79)	(0.57)	(0.72)
Education	− 0.56	0.59	− 0.39
	(1.96)	(2.17)	(2.12)
R^2 overall (within; between)	0.43	0.41	0.42
	(0.70; 0.21)	(0.73; 0.19)	(0.74; 0.20)
Countries	118	136	130
N	296	333	321

Robust standard errors of coefficients in parentheses. Time dummies included in all specifications

*, **, *** correspond to a 10, 5 and 1% level of significance

5. Happiness Levels and Resource Wealth

In this section, we extend our analysis by looking at how happiness levels (rather than changes over time) correlate with our measures of resource affluence. In Sect. 4 we found evidence showing that oil-rich nations tend to experience happiness losses over time, other things equal—ere, we examine whether these nations also rank lower in the global happiness distribution. Figure 2 replicates our earlier Fig. 1 for happiness levels in 2012. The horizontal red line corresponds to The average happiness level for the entire sample (5.9). High levels of happiness appear both for oil rich and scarce economies; however, one can also observe that for high levels of oil dependence (where oil accounts for more than 10% of GDP), there is a proportionately larger share of countries lying below the sample-average happiness level.

Columns (30)–(32) of Table 8 replicate the last three columns of Table 1 (which include the three resource dependence indices), with the level of happiness as the dependent variable. Columns (33)–(35) repeat these specifications for the resource abundance measures. Only two resource wealth indices appear to be statistically significant. Agriculture abundance correlates positively with happiness levels, other things being equal (Column (35); on the other hand, oil-dependent economies score lower in the global happiness ranking [Column (30)]. In the case of oil dependence, the effect, though, is not of a substantial magnitude; a difference in resource dependence between a country entirely dependent on oil and a country with no oil resources (i.e. a difference equal to 100%) would only imply a lower happiness level for the former by 0.76 units. This suggests, that although oil dependence results in happiness losses over time (see Sect. 4), this has still not been translated into a significant downgrade of oil-rich nations in the global happiness distribution. This is similar to what economists observe when looking at the resource curse through the lens of the income per capita distribution—while oil-rich nations tend to grow at a slower pace, they still do not score much lower in the global income per capita distribution, other things being equal (see Carmignani and Chowdhury, 2012).

Table 6 Changes in happiness and oil dependence (2SLS with latitude/ethnic fractionalisation as instruments)

Panel A: (second stage regression)	ΔHappiness (19)	ΔHappiness (20)	ΔHappiness (21)	ΔHappiness (22)	ΔHappiness (23)	ΔHappiness (24)
Constant	− 0.02	1.30	− 0.27	− 1.36	− 2.24	− 1.13
Happiness (t − 1)	− 0.59***	− 0.56***	− 0.50***	0.66***	− 0.68***	− 0.64***
	(0.08)	(0.09)	(0.06)	(0.07)	(0.06)	(0.06)
Oil dependence	− 1.02**	− 1.00**	− 1.25***	− 3.33*	−2.32*	− 1.55*
	(0.46)	(0.50)	(0.51)	(2.03)	(1.39)	(0.86)
Income pc	0.43***	0.34*	0.39***	0.77***	0.75***	0.59***
	(0.10)	(0.19)	(0.05)	(0.28)	(0.29)	(0.19)
Growth	2.05***	2.17	1.87***	2.11***	2.79***	2.38***
	(0.69)	(7.13)	(0.62)	(0.70)	(0.88)	(0.70)
Unemployment	− 1.57	− 1.65	− 1.19	− 1.52	− 2.12*	− 1.72*
	(1.00)	(1.11)	(0.94)	(1.18)	(1.14)	(1.03)
Education	0.13	− 2.92	− 1.45	3.46	4.22	2.19
	(3.72)	(5.98)	(3.32)	(5.16)	(5.71)	(4.82)
Gini			0.21			
Democracy				− 2.34		
Government effectiveness					− 0.46	
Control of Corruption						− 0.20
						(0.30)
R^2 overall	0.39	0.28	0.40	0.28	0.39	0.39
Panel B: (first stage regression)	Income pc	Growth	Gini	Democracy	Government effect	Control of corruption
Constant	4.50	0.28	46.10	0.60	− 4.84	− 5.06
Latitude	0.04***	0.01	− 0.37***	0.002**	0.009**	0.02***
	(0.01)	(0.01)	(0.05)	(0.001)	*	(0.01)
					(0.003)	
Ethnic Fractionalization	− 0.21	-0.03*	0. 84	0.10	0.28**	0.31**
	(0.26)	(0.0)	(2.56)	(0.05)	(0.13)	(0.16)

Robust standard errors of coefficients in parentheses. Time dummies included in all specifications

*, **, *** correspond to a 10, 5 and 1% level of significance

Table 6 (continued)

Panel B: (first stage regression)	Income pc	Growth	Gini	Democracy	Government effect	Control of corruption
Happiness (t − 1)	0.58*** (0.05)	0.01 (0.01)	− 0.18 (0.70)	0.01 (0.01)	0.01 (0.03)	− 0.01 (0.04)
Oil dependence	1.15** (0.52)	-0.01 (0.01)	− 15.22*** (6.33)	− 0.93*** (0.10)	− 2.51*** (0.26)	− 2.16*** (0.32)
Income pc		− 0.03*** (0.01)	0.20 (0.68)	0.11*** (0.01)	0.52*** (0.04)	0.51*** (0.04)
Growth	–2.34*** (0.68)		− 1.88 (7.68)	− 0.05 (0.13)	1.25*** (0.33)	1.11*** (0.41)
Unemployment	-0.02 (0.01)	− 0.01 (0.03)	37.38*** (11.19)	0.09 (0.22)	− 0.93* (0.55)	− 0.69 (0.68)
Education	0.04 (0.04)	− 0.59 (0.39)	34.33 (41.68)	1.13 (0.79)	7.53*** (1.97)	8.59*** (2.43)
R2 overall Countries	0.55 225	0.31 225	0.39 217	0.63 223	0.84 225	0.84 225
N	84	84	84	87	88	88

Table 7 Changes in happiness and oil dependence (some further robustness checks)

Dependent variable	Developing countries (25)	Developed countries (26)	Tropics (27)	Global financial crisis (28)	Exchange rates (29)
Constant	0.49	− 1.39	− 0.39	− 0.57	0.38
Happiness (t − 1)	− 0.63*** (0.06)	− 0.38*** (0.08)	− 0.67*** (0.09)	− 0.60*** (0.06)	− 0.60*** (0.06)
Oil dependence	− 1.42** (0.63)	− 0.25 (0.44)	− 2.06** (0.93)	− 1.00* (0.55)	− 1.01* (0.54)
Income pc	0.44*** (0.07)	0.40*** (0.11)	0.60*** (0.14)	0.44*** (0.06)	0.43*** (0.06)
Growth	1.05 (0.79)	1.99*** (0.67)	1.65 (1.34)	1.44** (0.54)	0.61 (0.54)
Unemployment	− 1.74** (0.89)	− 2.60* (1.96)	− 1.05 (1.33)	− 2.11*** (0.89)	− 1.86** (0.83)
Education	− 2.02 (2.36)	0.24 (2.72)	− 5.15 (4.98)	0.95 (2.02)	0.95 (2.02)
Exchange rate (depreciation)					0.09 (0.19)
R2 overall (within; between)	0.43 (0.68; 0.32)	0.56 (0.71; 0.15)	0.28 (0.74; 0.07)	0.41 (0.71; 0.20)	0.42 (0.68; 0.21)
Countries N	81 192	42 104	49 109	118 234	118 296

Robust standard errors of coefficients in parentheses. Time dummies included in all specifications

*, **, *** correspond to a 10, 5 and 1% level of significance

Oil Rent

Figure 2 Happiness and oil dependence. Note: Abbreviations correspond to 3-letter country ISO codes Put (below figure)

Table 8 Happiness levels and natural resource dependence

Dependent variable	Happiness (31)	Happiness (31)	Happiness (32)	Happiness (33)	Happiness (34)	Happiness (35)
Constant	1.40	1.21	1.01	1.40	1.24	–0.15
Oil dependence	− 0.76*					
Mineral dependence		1.28				
Agricultural dependence			0.30			
Oil abundance				–0.01		
Mineral abundance					0.02	
Agricultural abundance						0.17***
Income pc	0.56*** (0.04)	0.58*** (0.03)	0.60*** (0.05)	0.56*** (0.01)	0.57*** (0.03)	0.53*** (0.03)
Growth	0.4* (0.29)	0.45 (0.29)	0.44 (0.28)	0.48* (0.29)	0.42 (0.30)	0.42 (0.29)
Unemployment	− 0.04*** (0.01)	− 0.04*** (0.01)	− 0.04*** (0.01)	− 0.04*** (0.01)	− 0.04*** (0.01)	− 0.04*** (0.01
Education	0.02 (0.03)	0.04 (0.03)	0.03 (0.03)	0.02 (0.03)	0.04 (0.03)	0.03 (0.03)
R2 overall (within; between)	0.59 (0.25; 0.66)	0.61 (0.23; 0.68)	0.61 (0.24; 0.66)	0.59 (0.25; 0.65)	0.62 (0.23; 0.68)	0.62 (0.24; 0.67)
Countries N	134	152	155	134	162	155
N	434	500	478	434	500	478

Robust standard errors of coefficients in parentheses. Time dummies included in all specifications

*, **, *** correspond to a 10, 5 and 1% level of significance

6. Conclusions

There has been a growing interest in recent years in the 'resource curse', and more generally in the relationship between natural resources and several welfare indices. In parallel (but regrettably independently), a separate empirical literature in recent decades has probed into the determinants of happiness and subjective well-being using either country or household data. To our knowledge, this is the first empirical attempt to bring these two separate strands of the literature together. Consistent with prior empirical evidence of a resource curse in oil-rich nations, we find that oil rents are negatively linked to improvements in happiness over time. This happiness 'resource curse' curse appears to be oil-specific and holds both for the levels as well as for changes in happiness.

These findings have significant policy implications for oil-rich nations. Governments in these countries need to take corrective actions that improve the average life satisfaction of their citizens (in line with the discussion of Sects. 2 and 3—i.e. by ensuring a more equitable distribution of oil rents, more transparency and accountability, more efficient bureaucracies, etc.). The extractive industry needs to be actively involved in such debates to ensure that any ancillary benefits are enhanced (e.g. in terms of local employment, infrastructure), while any negative externalities (e.g. regarding displacement of local communities, environmental impacts) are minimised. More broadly, policy-makers and researchers need to realise that the resource curse focus needs to shift from the immediate (and often more visible) growth effects towards broader welfare impacts—in other words, any development strategy based on extraction needs to critically reflect on the intended use of accrued resource rents and the distributive aspects of associated policies. We argue that measured happiness would make a better target for government policy (in oil rich states but not only) than GDP. This stresses the necessity of improving the data reliability of happiness measures in the future (ideally across multiple dimensions of human well-being) and creating adjusted GDP values that incorporate elements of well-being typically ignored in national accounts (e.g. environmental and social externalities, informal production, inequality in income, and access to resources). By construction, existing happiness indices are constrained by an upper and lower bound—in other words, while individuals and countries can perpetually get wealthier (at least, in theory), increases in happiness cannot be without limits.

The relationship between natural resource management and several measures of socio- economic development is intriguing, but certainly a complex one (as evident from the number of empirical analyses on the issue in the last two decades), and our paper is simply a first attempt to explore the fascinating relationship between oil rents and happiness. Several limitations remain, however. Future empirical work could attempt to unravel the channels (mechanisms) through which natural resources can affect happiness levels and changes. Moreover, our happiness index

is simply an average and, hence, does not reveal any information about the distribution and inequality of perceived well-being levels within each country's population. Case studies and more disaggregated econometric models should complement the more aggregate country-specific analysis by examining the localised effects of oil presence (e.g. as in the case of environmental externalities or employment creation). It also might be the case that the scale used to measure happiness is perceived differently within different cultural contexts and subnational studies may be more suitable for comparison purposes. Furthermore, the sub periods of our analysis have a relatively short time span (of 4 years); therefore, a longer time series would allow relationships to be uncovered that are less likely to be influenced by short-term fluctuations (in happiness and other explanatory variables).

Appendix 1

Albania	Iran	Tajikistan
Algeria	Iraq	Thailand
Angola	Ireland	Togo
Argentina	Israel	Trinidad and Tobago
Armenia	Italy	Tunisia
Australia	Jamaica	Turkey
Austria	Japan	Ukraine
Azerbaijan	Jordan	United Kingdom
Bangladesh	Kazakhstan	United States
Belarus	Kenya	Uruguay
Belize	Kuwait	Uzbekistan
Belgium	Kyrgyz Republic	Venezuela
Benin	Latvia	Vietnam
Bolivia	Lebanon	Yemen, Rep.
Botswana	Lithuania	Zambia
Brazil	Luxembourg	Zimbabwe
Bulgaria	Malaysia	
Cambodia	Malta	
Cameroon	Mauritania	
Canada	Mexico	
Chad	Mongolia	
Chile	Morocco	
China	Mozambique	
Colombia	Namibia	
Congo, Dem. Rep.	Nepal	
Congo, Rep.	Netherlands	
Costa Rica	New Zealand	
Croatia	Nicaragua	
Cuba	Nigeria	
Cyprus	Pakistan	
Czech Republic	Panama	
Denmark	Paraguay	
Dominican Republic	Peru	
Ecuador	Philippines	
Egypt	Poland	
El Salvador	Portugal	
Estonia	Romania	
Finland	Russia	
France	Saudi Arabia	
Gorgia	Senegal	
Germany	Serbia	
Ghana	Singapore	
Grees	Slovenia	
Guatemala	South Africa	
Haiti	Spain	
Honduras	Sri Lanka	
Hungary	Sudan	

Iceland	Switzerland
India	
Indonesia	

Appendix 2

Table 11 List of variables used in regressions

Happiness	Average reported satisfaction with life of the residents of each country. Scale from 0 to 10—larger values correspond to higher levels of happiness. Source: Gallup World Poll (2017)
Oil dependence	Oil rents as a share of GDP. Source: World Bank (2016)
Mineral dependence	Non petroleum Mineral (from Coal, tin ,gold, lead, nickel, zinc, iron, copper, nickel, sliver, bauxite ,phosphate, ect) in GDP, Source: World Bank(2016)
Agricultural dependence	Value of agricultural production in GDP. Source: World Bank (2016)
Oil/mineral/agricultural abundance	The log of oil/mineral/agricultural in per capita terms. Source: World Bank (2016)
Income pc	The log of real GDP per capita at 2010 international prices. Source: World Bank (2016)
Growth	Growth in real GDP per capita. Source: World Bank (2016)
Unemployment	Unemployment as a share of total labour force. Source: International Labour Organization (2016)
Education	Total educational expenditure as a share of total income. Source: United Nations (2016)
Inflation	Annual inflation rate (based on GDP deflator, 2010 base year).Source: World Bank (2016)
Trade	Share of total value of imports and exports in GDP. Source: World Bank (2016)
Exchange rate (depreciation)	Percentage change in official exchange rate for each period (local currency US), Positive values denote depreciation. Source: World Bank (2016)
Democracy	0–1 liberal democracy index (capturing the importance of protecting individual and minority rights against the tyranny of the state). The index measures the quality of democracy by the limits placed on government. Source V-Dem (2017)
Rule of law	Rule of law index that captures perceptions of the extent to which agents have confidence in and abide by the rules of society, and in particular the quality of contract enforcement, property rights, the police, and the courts, as well as the likelihood of crime and violence. − 2.5 to 2.5 scale—higher values correspond to better performance in rule of law. Source: WGI (2016)

Government effectiveness	The government effectiveness index captures perceptions of the quality of public services, the Quality of the civil service and the degree of its independence from political pressure− 2.5 to 2.5scale—higher values correspond to better performance in rule of law. Source: WGI (2016
Control of corruption	Control of corruption index that captures perceptions of the extent to which public power is exercised for private gain, including both Petty and grand forms of corruption, as well as "capture" of the state by elites and private interests.− 2.5 to 2.5 scale—higher values correspond to lower levels of corruption. Source: WGI (2016
CO_2	Carbon dioxide damage in national income. Source: World Bank (2016)
Gini	Gini index of income inequality. Source: UNU-Wider (2017)
Ethnic fractionalisation	Ethnic fractionalisation index (0–1 continuous scale, with higher values corresponding to more ethnically heterogeneous societies). Source: Montalvo and Reynal-Querol (2005)
Latitude	Unemployment as a share of total labour force. Source: International Labour Organization (2016)

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CHAPTER 4 POST-SECESSION SUDAN AND SOUTH SUDAN: A COMPARATIVE STUDY OF ECONOMIC PERFORMANCE, EXPORT DIVERSIFICATION, AND INSTITUTIONS[29]

Abstract

Sudan and South Sudan have a long history of civil war that has played an important role in the economic performance of the two countries before their separation in 2011. Moreover, although ethnic and tribal polarization were the most common catalyst for the conflict, oil has played a determinant role in the economic development of both regions before and after their separation. The introduction of oil into the Sudanese economy in 1999 has had a positive impact on growth. However, oil has also been associated with many challenges, especially those related to economic structure, export structure, economic stability, and institutional quality. Economic dependence on oil increased with the increase in the share of oil in exports and with the increase in government revenues. Therefore, the secession of South Sudan in 2011 was a major economic shock to both economies. Moreover, this event created a situation in which the new country experienced a sudden influx of oil reserves. At the same time, the parent country witnessed a sudden loss of 70% of its proven oil reserves. This makes the case of Sudan unique and provides a very rare opportunity for macroeconomists to address the impacts of this shock on both economies. This paper uses the recent secondary data of both counties to analyze and compare the impact of oil revenues transfer on Sudan and South Sudan economies in the post-secession era. The paper will address the impact on export diversification, economic stability, and institutions. Based on the outcome of the discussion in this paper, oil loss has created incentives for export diversification, sound macroeconomic policy as well as institutional improvement in Sudan. Reciprocally, the data of South Sudan's economy reflect a premature oil dependence that has led to export concentration, institutional degradation, and macroeconomic instability. Accordingly, Sudan's economy shows a greater likelihood of achieving export diversification, macroeconomic stability, and institutional reforms compared to South Sudan.

Keywords**:** *Sudan, South Sudan, Export diversification, oil, institutions, macroeconomics*

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1. Introduction

The positive relationship between export diversification and growth has been established by the outcomes of many studies (see Al-Marhubi, 1998; Husmann, Hwang and Rodrik, 2007; Arip, Mohammad Affendy and Yee, Lau Sim and Abdul Karim Bakri, 2010). However, this relationship gains greater importance in the case of oil-rich countries. Oil dependence has been linked to the lack of export diversification, weak institutions, and economic underperformance in oil-rich countries. In theory, several studies present the Lack of export diversification as one of the potential channels for the curse of natural resources (see Auty, 1988, 1993; Humphreys, Sachs and Stiglitz, 2007; Gelb, 2010). This has been attributed to number of economic and political factors (see Auty, 1988, 1993; Humphreys, Sachs and Stiglitz, 2007; Gelb, 2010). Empirically, many cross-country and country case studies provide strong support for the negative relationship between export diversification and resource abundance (see Husmann et. al, 2005; Pierola, 2012; Adebayo, 1999; Heidrian and Green, 1989).

Empirical evidence has also been provided to demonstrate the negative impact of oil on macroeconomic management (see Sturm, Gurtner and Gonzalez-Alegre, 2009; Morgen, 1979 and Lopez-Murphy, Villafuerte, 2010). This poor performance is attributed, on the one hand, to the inefficiency of fiscal and monetary policies in oil–rich countries, and, on the other hand, to the volatile and uncertain nature of oil revenues due to price volatility and dependence on international demand. Fluctuating revenues create uncertainty about the government budget and hamper development projects. Consequently, the inefficiency of macroeconomic policies hinders government efforts to control inflation. Moreover, the fluctuation of oil revenues is reflected in the fluctuations in current account balances. Furthermore, oil-rich countries end to have higher government expenditure compared to non-oil economies.

Oil dependence is said to have a significant negative impact on institutional quality as oil affects institutions through patronage and rent seeking mechanisms. Many studies have shown that oil revenues are used in patronage practices to seize power by the ruling regimes in oil-rich countries. This usually results in the misallocation of oil revenues in politically appealing but economically unproductive activities (Wiig and Kolstad, 2011). Oil also triggers and intensifies the contest for rent over time, which eventually crowds out investment from productive activities. Several studies have also shown that oil inhibits democratic transition in resource-rich countries. According to Ross (2001), the antidemocratic impact of oil is attributed to three effects. Firstly, there is the “rentier effect”, in which governments impose low taxes and use patronage to prohibit democratic transition. Secondly, there is the “repression effect”, in which governments use oil revenues to repress public democratic ambitions. Thirdly, there is the “modernization effect”, which means the absence of social and cultural changes required for democratic transition in oil rich

countries. Consequently, the absence of democracy obstructs economic growth in resource rich countries. (Collier and Hoeffler, 2009). Oil is also blamed for the spread of corruption. Lack of transparency and absence of democracy open the door for corrupted activities. Furthermore, week institutions allow bribery practices and boost corruption. Corruption leads to the misallocation of resources and hence displace local and foreign investment, which, in turn, hampers long-term economic growth.

This paper will contribute to the discussion by addressing the unique case of Sudan and South Sudan. The paper will compare the impact of the oil loss on Sudan and the emergence of the booming sector on South Sudan on both countries' macroeconomic stability, export diversification and institutions. This can have important policy implications since there are many oil-rich countries that are characterized by ethnic, religious and political polarization. These differences threaten the unity of these countries and may lead them to follow the same path as Sudan (United Sudan) in the future.

Table (1) Sudan and South Sudan: Country profiles (2019)

Table 1 Mega trends

Indicators	**Sudan**	**South Sudan**
Land area	1.886 million KM^2	619,745KM^2
Population	41.8 million	10.98 million
Oil reserve	5 billion	3.5 billion
HDI	0.507 (rank: 168)	0.413 (rank: 186)
GDP (2019)	USD $55 billion	USD $2 billion
Growth	-2.4%	5.8%
Inflation (2019)	50.43%	24.27%

Data Source: World Bank, Statista, Trending economics

In united Sudan, the north and south relationship has had a long history of conflict which can be attributed to historical, ethnic, economic and tribal constituents. The tension between the North and the South was mainly inflamed by the long legacy of slavery and discrimination. While Arab-Islamic culture prevailed in the north, the south was dominated by tribal kingdoms and a mixture of Christian and local religions. Furthermore, these variations were further emphasized by British colonial policies (1899-1956). The adoption of the closed areas policy prevented the spread of Arab and Islamic culture in southern Sudan. In addition, economic development of southern Sudan was ignored by the British administration while economic development and modernization had been concentrated in northern Sudan.

Nevertheless, even after Sudan's independence, the cultural and economic neglect of southern Sudan continued with successive governments in Khartoum. This long history of discrimination and marginalization led to the emergence of armed liberation movements in southern Sudan against the northern government in Khartoum. The Anyanya rebellion or Anyanya I and Anyanya II movements led by Gordon Murtat and Joseph Lagus fought against the government in northern Sudan in the first Sudanese civil war between 1956 and 1972. This war ended with the signing of the Addis Ababa Agreement, which granted the southern Sudan region partial autonomy.

The peace period which followed Addis Ababa agreement was firstly disturbed by Chevron's discovery of oil in southern Sudan. The administration of president Nimeri (1969-1985) ignored South Sudanese officials during the licensing of the oil fields. Moreover, the government failed to transform oil revenues into the economic development for the people of South Sudan. Furthermore, in September 1983 President Nimiri announced the "sharia laws" which officially turned Sudan into an Islamic states. People of South Sudan perceived this action as the complete neglect of their religious and cultural particularities as citizens of Sudan. As a result, the second civil war erupted in 1983 and was this time led by John Garang. This civil war came to an end with the signing of the Comprehensive Peace Agreement (CPA) in 2005. However, during this period, oil was exploited for the first time in 1999, and this time by the Omar Al- Bashir regime. Al-Bashir's regime had entered into a partnership to produce and export oil with Chinese, Malaysian, and Indian companies. Similar to Nimiri's government, Al-Bashir's administration also neglected South Sudan in the oil decision-making process. Additionally, during the period of (1999-2005) oil revenues were used to increase the security and military potentials of the north and also increased the separation aspirations in the south. Tens of southern tribes were displaced by the government from their historical regions to allow for stable oil production. The government also prevented the delivery of humanitarian aid for the pro-rebellion tribes. Although not focusing on oil, the CPA contained provision on wealth sharing between northern and southern Sudan. These provisions determined the division of oil wealth between the two regions based on a 50% share after deducting the oil stabilization fund share. The agreement also acknowledged the joint management of oil resources by both parties. However, although the CPA ended the war, many pending issues were still unsolved between the two parties. At the heart of these issues was the conflict over the border demarcation, especially in oil-rich regions such as Abyie. At the end of the CPA period, on January 2011, 98.83% of the people of southern Sudan voted for the independence of Sudan in a referendum of self-determination.

The separation of Sudan's oil-rich region had a disastrous effect on its economy. This was mainly because Sudan was heavily dependent on oil at the time of South Sudan's independence. Oil was officially exploited in Sudan in 2000, and since then it had been driving growth, dominating exports and being the main source of

government revenue. Oil dependence crowded-out agriculture and manufacturing and led to the growth of the non-tradable service sector. Oil also had a negative impact on Sudan's institutions and intensified the spread of corruption. Consequently, the loss of 70% of proven oil reserve for South Sudan represented the strongest economic shock the country has ever witnessed. The economy declined sharply after 2011. The lack of diversification caused by oil represented the main challenge to the post-oil Sudan economy. Lack of an economic alternative to oil has resulted in a large deficit in the government budget as well as the balance of payments. However, despite the fact that Sudan is actually endowed with diversified natural resources, mainly agriculture, livestock and other minerals, such as gold, the country does not have a diversified mix of exports. This lack of diversification has played an important role in the economic deterioration that took place after 2011. Nonetheless, the loss of oil revenues can represent a good opportunity for the government to increase its investment in the agricultural and industrial sectors, which, if it occurs, will improve the diversity of country's export mix in the long run.

By the same token, South Sudan inherited many characteristics of the parent country. South Sudan's dependence on oil has grown rapidly as other sectors, particularly livelihood, agriculture and pastoralism, suffer from the lack of productivity and high production costs. Furthermore, these sectors represent only 15 % of South Sudan's GDP; hence, the newly born country cannot depend on these sectors to boost its fragile and weak post-conflict economy. As a result, the new state is also characterized by the lack of diversification and has shown a pattern of export concentration. The fact that the new state is oil-rich, nevertheless, increases its likelihood of developing a concentrated type of economy and limited export mix in the long-term in comparison to Sudan.

In a descriptive narration, this paper attempts to compare the impact of oil reserve transfer on the macroeconomic performance, institutions, and export structure of Sudan and South Sudan in the post-South Sudan secession era. The paper argues Sudan will witness economic hardship in the short-term, but this loss will lead eventually to the adoption of sound macroeconomic policies, the improvement of institutions and the promotion of export diversification in the long run. In contrast, South Sudan will more likely adopt less robust macroeconomic policies, have inefficient institutions and a less complex export structure. Therefore, in the long-term, Sudan will have more opportunity to achieve sustainable economic growth than South Sudan.

The paper comes in four sections. The second section will provide a brief literature review of the thesis of natural resource and economic growth with an emphasis on its impact on macroeconomic policies, institution and export diversification. The literature review will also broadly address the empirical group of the studies that discuses both Sudan and South Sudan economic evolution pre- and post-2011 separation. The third section provides a comparative analysis of oil production and

export, the oil impact on macroeconomic selected variables, the institutions, and the export structures in the two states in the post-2011 period. The paper will wrap up with a conclusion and some policy recommendation in Section 4.

2. Literature Review

The curse of natural resources is still a topic of ongoing research since Auty first referred to the phenomenon in 1993. Since then, several studies have provided empirical evidences for the negative correlation between resource abundance and economic growth (see Sachs and warner 1995, 2001; Ross, 2001; and Smith, 2004). Other studies have also probed into the transmission channels through which the abundance of natural resources can impact growth (Papyrakis and Gerlagh, 2004). For example, Halland and Bleaney argue that oil has a negative impact on macroeconomic variables. They demonstrate that fiscal policy volatility caused by oil price volatility is one of the transmission mechanisms of the resource curse. Moreover, political scientists have introduced weak institutions as one of the transmission mechanisms of the resource curse. This strand of literature shows that oil dependence erodes institutions in resource-rich countries. This happens through two mechanisms: the rent-seeking behavior, which crowd-out investment from productive sectors and the spread of corruption, which leads to the misallocation of resources and reduces the economy's ability to attract Foreign Direct Investment (FDI) (see Gylfason, 2001; Sala-i-Martin and Subramanian, 2003; Mavrotas, Murshed and Torres, 2011; Hodler 2006; Deacon and Hillman, 2014).

According to the resource curse hypothesis, oil dependence also stimulates export concentration. The thesis also attributes this negative relationship to the deindustrialization effect, rent seeking, and the institutional defect (see Gylfason and Zoega, 2002; Krugman, 1987; Murshed, 2004; Dunning, 2005; Mehlum et al., 2006). This has been also supported by many studies that focus on resource-rich countries. Furthermore, Auty, 1988, 1993; Humphreys, Sachs and Stiglitz, 2007 introduced export diversification as one of the key strategies that could help resource-rich countries to avoid the resource-curse. Empirically, several studies have provided evidence for the negative correlation between resource dependence and export diversification (see Alsharif, Battacharayya and Intartaglia, 2017; Muttaka, 2015; Heidrian and Green, 1989; Murshed and Serino, 2011). Other strand of literature attribute the negative impact of resource dependence on export diversification to the institutional degradation induced by resource dependence, particularly oil (See Battacharayya and Hodler, 2010, 2013; Arezki and Gylfason, 2011; Murshed and Torres, 2011). Based on this argument, the institutional malfunctioning leads to poor governance, which in turn leads to the misallocation of resources. Moreover, the lack of transparency that is usually associated with weak institutions also frustrates these countries' efforts to attract FDI. These arguments are supported by the outcomes of several empirical studies (see Albassam, 2015; Wiig and Kolstad, 2011; De waldemar, 2010 and Ahmadov, 2012).

Several empirical studies have addressed the political and economic role of oil in Sudan's modern history. According to Moro (2009), the discovery of oil played a paramount role in the outbreak of the second civil war in Sudan in 1983. However, the exploitation of oil in 1999 was the main driver of the staggering economic performance in Sudan. This economic performance supported the success of the CPA. Moro added that oil in Sudan benefited the Arab-dominated central government and caused hundreds of people to be displaced from their historical areas to allow the further exploitation of oil. Nour (2011) discussed the effect of oil on macroeconomic performance. Her study shows that oil has had a positive impact on economic growth. However, the study also shows that oil exploitation was associated with a number of macroeconomic challenges, namely high government spending, deterioration of agriculture and manufacturing, and lack of export diversification.

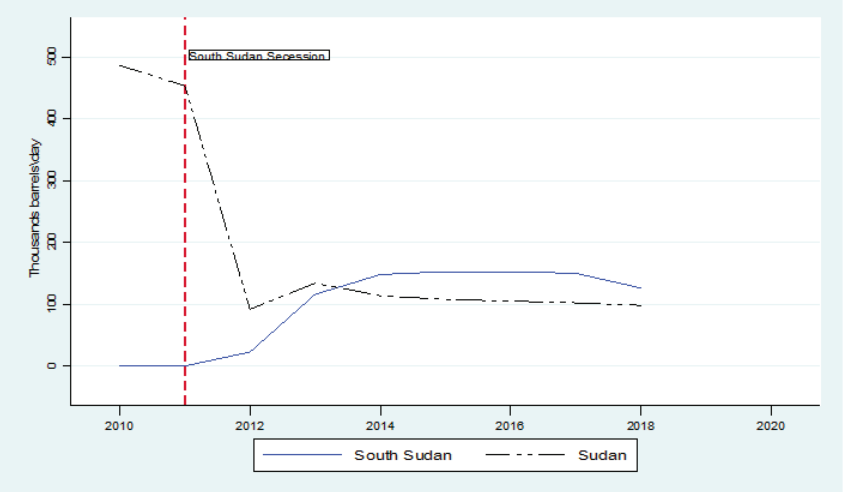
Moreover, a study by Khalifa (2016) focuses on the impact of oil dependence on the Sudanese economic structure. He explains that the expansion of the oil sector led to the deterioration of the agricultural sector and, as a result, led to an increase in Sudan's food imports. This, in turn, has eventually led to a persisting trade deficit. His paper also shows that the share of non-oil exports fell sharply compared to oil exports between 1999 and 2010. In a study of the impact of oil on agriculture, Gadkrim (2010) shows that the participation of the agricultural sector in Sudanese GDP decreased from nearly half of the country's GDP in 1999 to only one-third in 2007. His study also shows that the share of oil increased from 1.9% in 1999 to 18.6 % in 2007.Furthermore, Hassan and Abdullah (2014), studied that impact of oil on the service sector to address the symptoms of the Dutch disease in Sudan. Their study provided evidence for the causal relationship between oil revenues and the growth of the non-tradable sectors between 2000 and 2012.

Pedersen and Bazilian (2016) show that South Sudan, like Sudan, will face the same challenges associated with oil exploitation. Their study demonstrates the increase in oil dependence as a source of government revenues and hard currency in South Sudan. They also claim that oil dependence slows the development of other productive sectors, namely agriculture and fisheries. Moreover, their study shows that South Sudan inherited primitive institutions from Sudan. They also added that the country lacks the experience and institutions required to manage oil infrastructure and revenues. They therefore concluded that the resource curse in South Sudan is institutionally driven rather than revenue-driven. In contrast, Radon and Logan (2014) argue that poor governance and lack of institutional capacity, increased oil dependence and led to a premature deindustrialization in South Sudan. They use the “rentier effect” of Ross (2011) to show that oil revenues reduced government accountability to its people because of the government’s dependence on oil revenue rather than taxes as a major source of government revenue. Moreover, Basnett and Garang (2015) attributed the slowdown in economic development and export diversification to oil dependence and oil-driven civil

conflicts. Gelb (2013) presents export diversification as the first line of defense against the resource curse in South Sudan. He also identifies sound governance and robust fiscal management as the key drivers for economic diversification in South Sudan.

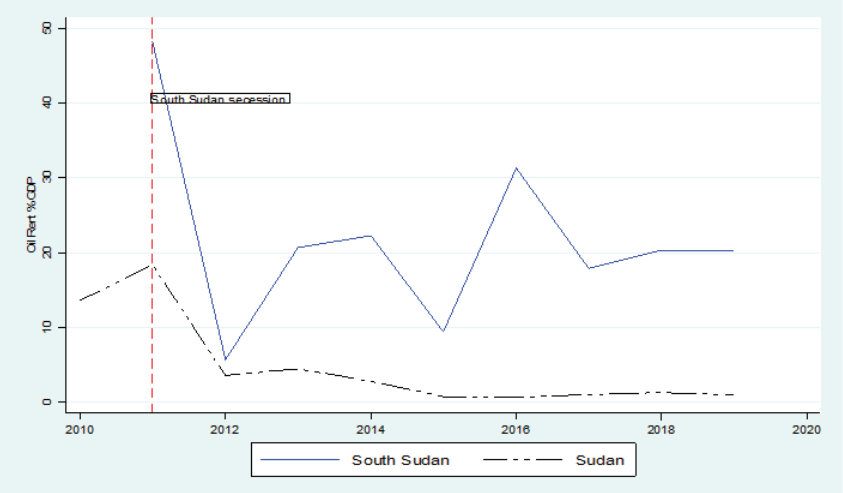
3. Oil Production, Rents and Export Diversification

Sudan was producing 480 thousand barrels per day (EIA, 2019) and oil rent was estimated at 18% of GDP (World Bank, 2020) when South Sudan seceded. After 2011, Sudan's oil production dropped to only 130 thousand barrels per day (see figure 1 below). On the other hand, oil production in South Sudan was estimated at 350 thousand barrels per day. Figure 2 also shows that oil rents decreased to 3% of GDP in Sudan after 2011, whereas the oil rents of South Sudan's government increased to the level of 48 % of GDP in 2011 (World Bank, 2020). Moreover, the oil exports of South Sudan also increased substantially to reach the level of 131 million barrels per year in 2013, see figure 3 below. Furthermore, South Sudan's other productive sectors, namely agriculture and mining, contributed with less than 4% and 3% of the country's GDP, respectively (World Bank, 2017). Accordingly, South Sudan will find it very difficult to avoid oil dependence since oil is the only available source of government revenue and foreign currency earnings. This situation will probably continue for a considerable time as the country needs to build the required infrastructure and accumulate the human capital to boost export complexity. As figure 4 shows, in comparison to South Sudan, Sudan has had a more balanced sectoral share of GDP since the separation of the two countries separated. The fact that the agricultural sector is more developed in Sudan, gives Sudan an advantage to diversify its export mix. Figure 4 also shows a slightly larger share of the industrial sector in GDP in both countries, but this was only induced by the contribution of oil as one of the components of the industrial sector. In fact, the manufacturing sector was actually declining in both countries due to the deindustrialization stimulated by the oil boom. Hence, despite the amount of oil being responsible for reducing the share of other commodities in the export mix, there is a great opportunity for agriculture and mining to replace oil as the main source of foreign exchange in the post-oil era. This is a real possibility due to the availability of required infrastructure and human capital in Sudan. On the other hand, South Sudan has to invest heavily in its agricultural infrastructure to increase the participation of these commodities in the export mix.



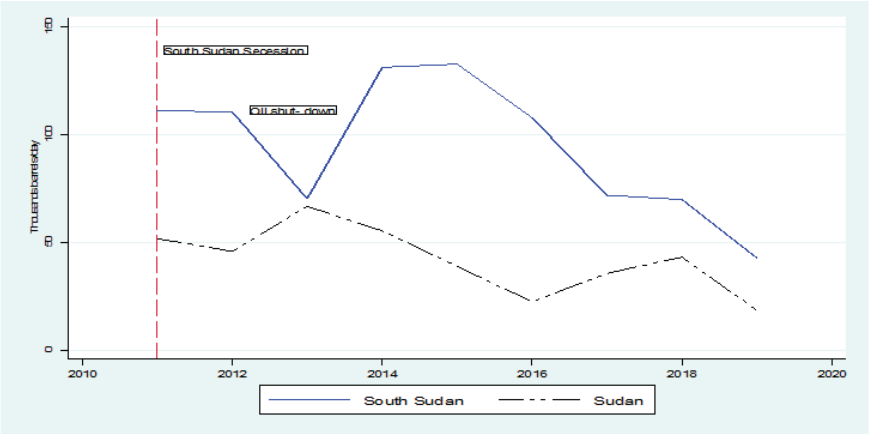
Data source: EIA

Figure 1 Sudan and South Sudan oil production (2010-2019)



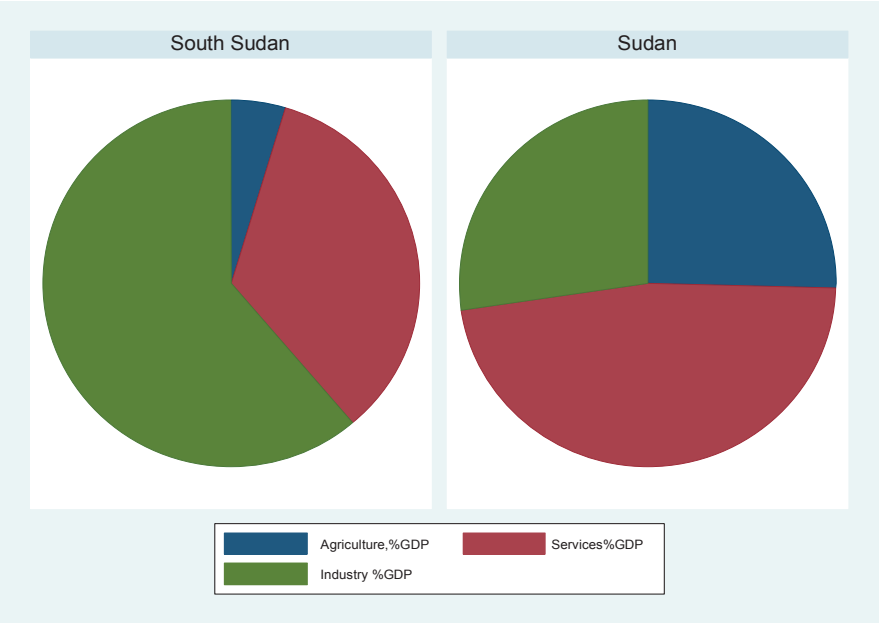
Data source: WDIs

Figure 2 Sudan and South Sudan Oil rents (2010-2019)



Data source: EIA

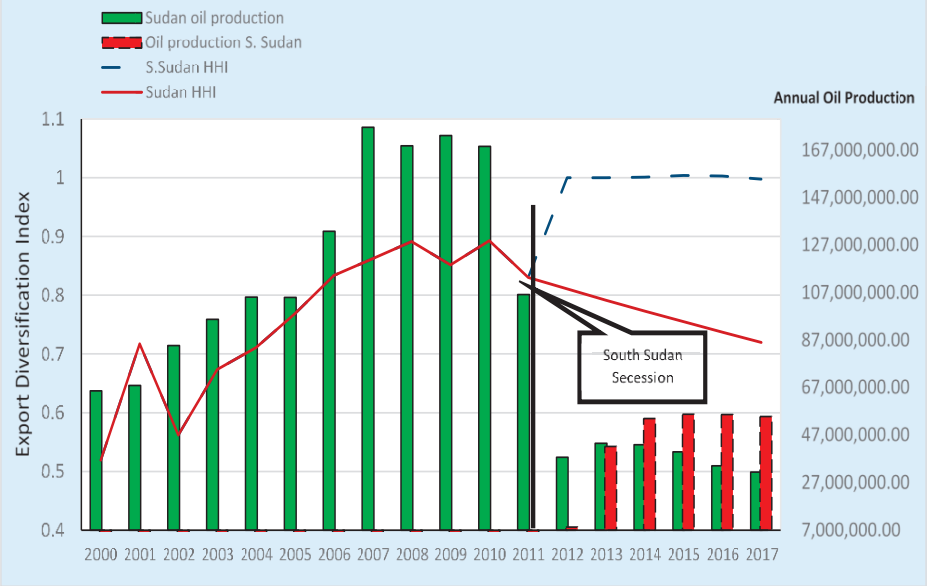
Figure 3 Sudan and South Sudan Oil exports (2010-2019)



Data source: WDIs

Figure 4 Sudan and South Sudan sectoral Share in GDP (2011)

With a primary-product economy, the united Sudan previously had a very low level of export diversification. During the eighties, Sudan's export mix was dominated by cotton. As cotton prices fell, however, it was overtaken by livestock, rain-fed crops, and irrigated crops. Hence, even before the exploitation of oil, Sudan's export mix was highly concentrated. Figure (5) illustrates the evolution of the Herfindahl-Hirschman Index (HHI) of Sudan and South Sudan between 2000 and 2017. The figure shows that Sudan's average HHI between 2000 and 2011 was estimated at 0.8. The figure also shows that the HHI index has increased steadily since 2000 from 0.5 in 2000 to 0.8 in 2011. The high level of HHI reflects the high dependency on and the dominance of oil in the Sudanese export mix. This has also been exacerbated by the deterioration of other sectors due to the oil-related crowding-out effect. Figure 6 shows a steady increase in the share of oil exports in total merchandize exports from 35% to 92% between 1999 and 2011. The figure also reveals the sharp decline in oil exports after South Sudan seceded in 2011.



Data Source: UNCTAD, FRED

Figure 5 Sudan and South Sudan HHI and oi Production (2000-2017)

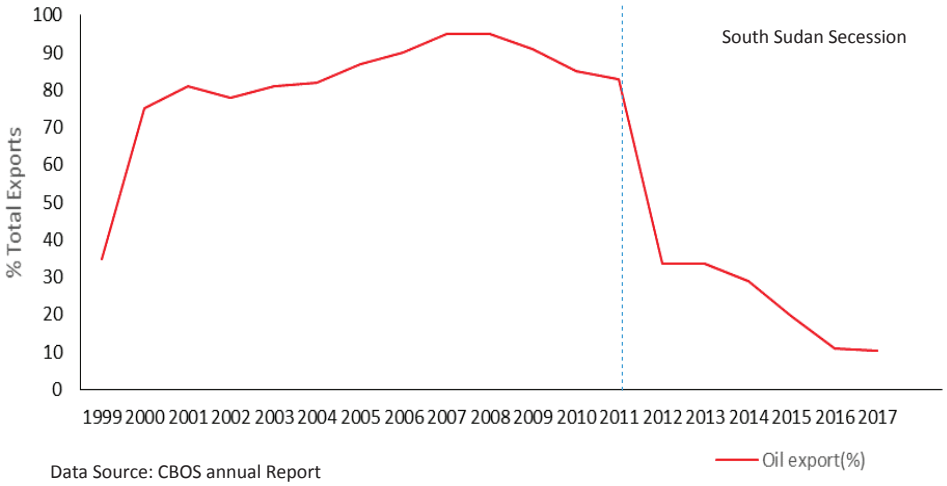


Figure 6 Sudan share of oil in total exports (1999-2017)

The increase in oil exports was at the expense of agricultural exports. Before oil production the agricultural sector represented 95% of country's exports. However, with the expansion of the oil sector, the rate of growth of the agricultural sector decreased and did not exceed 5.4% for the period 2000-2010 in comparison to 7.1% between 1990 and 1999 (ADB, 2016). Moreover, the share of agriculture in the export mix declined over time, and it accounted for only 75.3% of total non-oil exports between 2005 and 2009 (Khalifa, 2016). On the other hand, the manufacturing sector has historically had very limited participation in the Sudanese export mix. The participation of this sector did not exceed the average of 0.3% of Sudan's total merchandise exports in 2010 compared to 7.8 % in 2000 (UNCTAD, 2018). Therefore, it can be concluded that oil led to the negligence of agriculture and the displacement of domestic and foreign investment from agriculture. Furthermore, oil crowded the resources away from the manufacturing sector. This led to premature deindustrialization as non-tradable sectors were growing at the expense of tradable sectors. As a result, oil has prevented the development of the nascent manufacturing sector in Sudan.

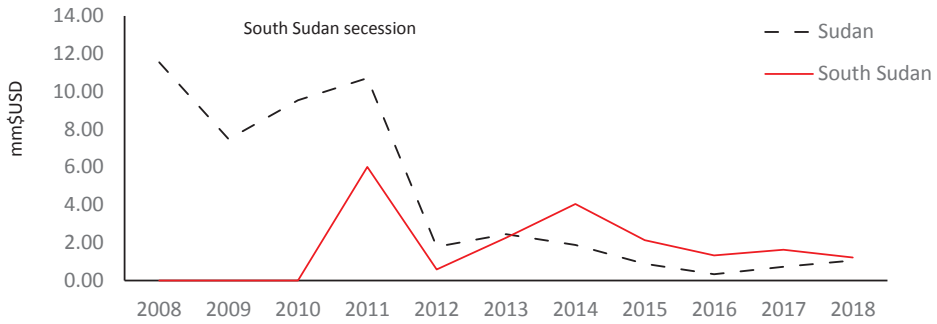
Moreover, the appreciation of the exchange rate due to the influx of oil revenues also reduced export competitiveness in the international markets. Accordingly, the contribution of both agricultural and manufacturing sector in the Gross Domestic Product (GDP) and GDP growth was deteriorating continuously causing more export concentration. Sudan's real effective exchange rate (REER) depreciated against the dollar during the 1980s.. This was attributed to a number of factors, namely drought periods, famines and the eruption of civil war in 1983 (Ebaidalla, 2014). Moreover,

during the period of (1990-1995) the Sudanese pound continued its devaluation against the dollar and reached SDG300/1$ and SDG430/1$ in 1994 and 1995 respectively, (Ebaidalla, 2019). However, starting from 1997, the influx of foreign direct investment in the oil sector and later the export of oil led to the stabilization of the REER. Accordingly, the REER appreciated form SDG250/1$ to SDG 240/1$ (Mustafa, 2019). Nonetheless, between 2011 and 2019 the currency depreciated drastically due to the loss of oil revenues.

As oil revenues declined, the government adopted a number of economic and sectoral reforms. Those reforms were meant to reduce supply and demand distortions. For example, in 2010 the government has partially released fuel subsidies and increased fuel prices. Fuel subsidies were representing 75% of tax revenues in 2011 (IMF, 2012). Furthermore, the government decreed rules to control the amount of foreign currency held by individuals and company reserves. Also, to eliminate the trade deficit, the government devaluated the currency by 66% in 2012 form SDG 2.67 to 4.42 per 1 USD (IMF, 2012). In addition to this, the government also increased tax rates and rationed public expenditure to reduce the budget deficit. Consequently, the HHI decreased slightly after 2011 at a declining rate of 2.4 % annually, and the average HHI score between 2011 and 2019 was 0.7. This improvement is reflected in figure 5 which shows a gradual decline in the HHI with the decline in oil production after 2011. This reflects a more diversified export mix in the post-oil economy. Hence, it could be argued that the shock of the oil-reserve loss raised the incentives for economic diversification.

Figure 5 also shows that the HHI index of South Sudan has increased steadily with the increase in oil production since its separation from Sudan in 2011. The average HHI is close to 1 during the period between 2011 and 2017. This is mainly due to the fact that South Sudan's economy is highly oil dependent. As can be seen in figure 7 below, right after its independence, oil was already representing 99% of the new state export mix. Moreover, despite South Sudan's agriculture and mining potentials, the long conflict in the region has resulted in a lack of economic infrastructure to promote these sectors. Additionally, these sectors suffer from the lack of the skilled labors and finance. Moreover, the fact that oil revenues account for 98% of the new country's budget makes allocating resources to other sectors more complicated. This will make the dependence on oil as the major source of government revenue seem more feasible than investing in making the economy and the exports more diversified, at least in the short term.

Hence, it could be argued that the loss of oil reserves gives Sudan more opportunity to achieve export diversification in the future compared with the new state of South Sudan.



Data source: OEC

Figure 7 Sudan and South Sudan Value of oil exports (2008-2018)

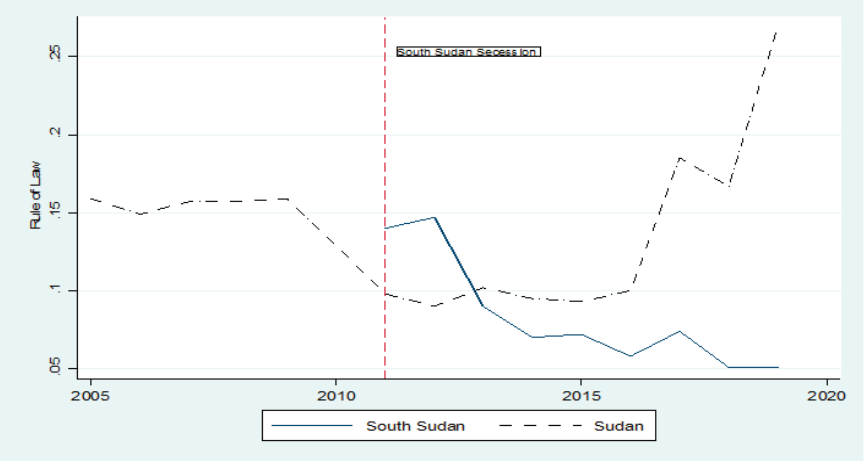
3.1 Oil and Institutional Quality in Sudan and South Sudan

Similar to the majority of resource-rich developing countries, oil represents a huge challenge to both Sudan's and South Sudan's institutional quality. The political instability since independence and the alternating tenures of democracy and dictatorship have already eroded Sudan's institutional quality. Nonetheless, the synchronization of oil exploitation and the absence of democracy between 2000 and 2010 have had the most destructive impact on Sudan's institutions. Figures (8, 9, 10 and 11) below show the evolution of some institutional indexes for Sudan and South Sudan for the period 2010-2019. The figures show that both Sudan and South Sudan have generally poor institutional qualities. Moreover, although Sudan used to have poor institutions even before the introduction of oil, oil rents exacerbated and deepened this problem. Consequently, the institutional deterioration stimulated by oil has prevented the economic transition from an oil-dependent economy to a more diversified and complex economy. The rent-seeking behavior led to the spread of patronage and corruption among political elites and public officials. Corruption has also created structural rigidities that have spoilt the investment environment for both domestic and foreign investors. Moreover, the ruling party and the incumbent elites faced a trade-off between adopting an economic diversification strategy and concentration of power. As a result, they have hindered economic diversification as concentrating power guarantees the accumulation of more oil rents. Consequently, they have prevented the reallocation of part of oil revenues to build the infrastructure that are required to support other sectors.

Sudan has gone through a serious economic crisis after its oil loss in 2011. These economic hardships have made institutional reforms a necessity. The loss of oil has forced the government to go through serious anti-corruption reforms to curb

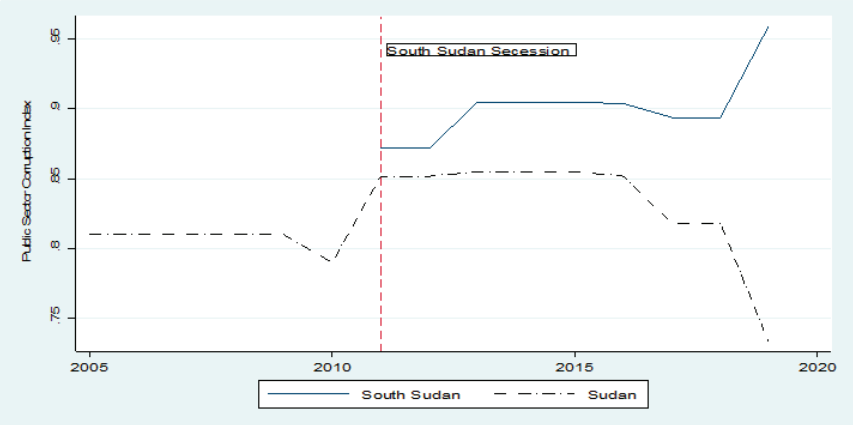
corruption and increase the efficiency of government institutions. The loss of oil also eroded the economic power of the ruling party and incumbent elites. This has diluted the power of the elite and, over time, led to the general uprising that eventually toppled the regime of Omar al- Bashir in April 2019. The outcomes of these reforms and changes have been reflected in the slight improvement in Sudan's institutional indexes, such as the rule of law, public sector corruption, political stability and government effectiveness after 2011.Hence, although the oil loss has had a huge negative impact on the Sudanese economy, it has also triggered institutional reforms that will increase the possibilities of export diversification in the future. The improvement in institutional efficiency, control of corruption, and the absence of rent-seeking will increase domestic investment as well as the flow of the foreign direct investment.

Despite its independence after a referendum on self-determination, South Sudan has inherited Sudan's institutional and economic problems. The figures below show South Sudan performance in terms of the rule of law, corruption, political stability and government effectiveness. They show that South Sudan scores very low in popular institutional quality indexes since its independence. The country has almost no civil institutions and suffers from both political and ethnical polarization. When South Sudan shut down oil production over a conflict on oil intakes, the country faced serious economic hardships. As a result, the country has had to cover this shortage through borrowing from both national and international lenders. Unfortunately, due to the absence of robust institutions, this borrowing did not find its way to the government treasury. Instead, the majority of these loans were spent on the ruling party's core patronage of the military network. Additionally, the rent-seeking behavior together with the ethnical and triable polarization nature of the new state has led to the start of the armed conflict in 2013. This conflict lasted for two years, and when oil production commenced in 2015, the oil market had already gone through a long-lasting recession and a reduction in oil prices. Hence, the contest on oil rents and poor institutional quality still prevents investment in infrastructure needed for export diversification. Furthermore, the oil-motivated corruption and conflicts have pushed the government to hinder any effort for export diversification as the government attempts to concentrate power by controlling oil rents. The civil conflicts also led to the loss of manpower and has hindered the development of agricultural, mining, and livestock production, which in turn reduces the country's future possibilities for achieving export diversification. For those reasons, South Sudan's institutional quality indexes have diverged considerably from Sudan's ones since 2012. This divergence in the two countries institutional performance can be attributed to the changes in oil reserves caused by their separation in 2011.



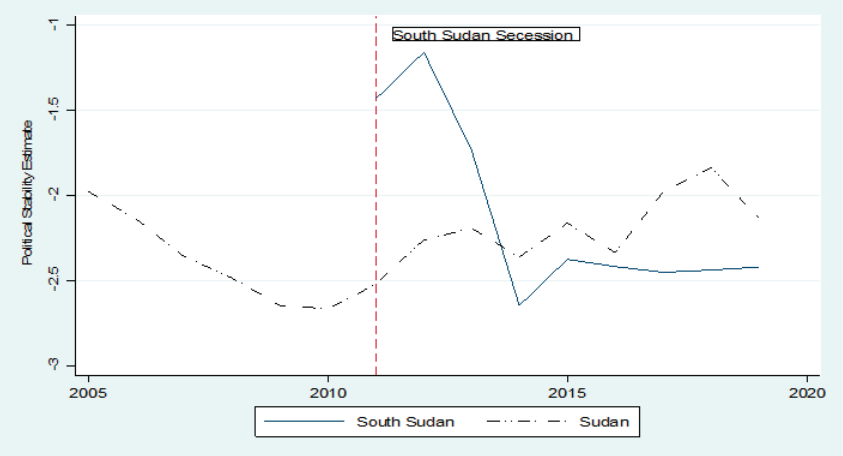
Data Source: Ve-dem 2019

Figure 8 Sudan and South Sudan Rule of law (2005-2019



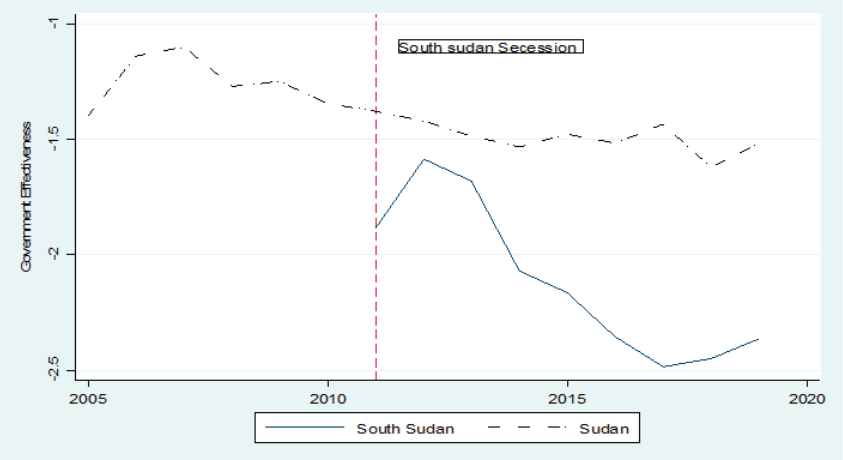
Data Source: Ve-dem 2019

Figure 9 Sudan and South Sudan Public Sector corruption Index (2005-2019)



Data Source: Ve-dem 2019

Figure 10 Sudan and South Sudan Political stability (2005- 2019)

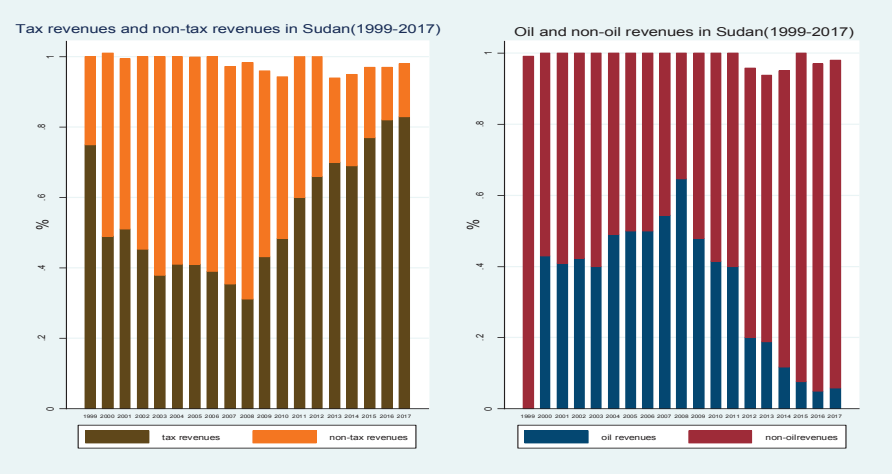


Data Source: Ve-dem 2019

Figure 11 Sudan and South Sudan Government Effectiveness (2005-2019)

3.2 Sudan's and South Sudan's Macroeconomic Performance in the Post-Secession Era

Sudan's economy is generally characterized by fluctuations and instability. This is due to a mixture of economic and political constituents. Furthermore, it has also been noted that periods of negative growth rates were longer and more volatile than periods of positive growth rates. However, since its exploitation in 1999, the oil sector grew steadily to outperform other sectors and lead economic growth in Sudan in the years that followed. The contribution of oil to economic growth increased from less than 3.1% in 1999 to 11.5% by 2008 (World Bank). However, during the same period, the contribution of the non-oil sector to GDP growth was flat, only registering at the level of 9% (UNDP, 2013). However, despite these growth gains, oil also caused economic instability, an instability induced by price and production volatilities; moreover, it has also been reflected in the government's revenue volatility. Oil represented 47% of the government's revenues (CBOS). Figure 12 below shows the share of oil and non-oil revenues in total government revenues between 1999 and 2010. The figure shows that while the contribution of non-oil revenues declined, oil revenues were increasing between 2000 and 2010. The period of oil exploitation also witnessed the reduction in tax revenues compared to non-tax revenues: in 1997, tax revenues represented 76% compared to 24 % for non-tax revenues, but by 2010, tax revenues represented only 48% compared to 52% for the non-tax revenues (Sidiq, 2012). Consequently, this has created uncertainty with the government's revenue and budget and hindered both development spending and public investment.

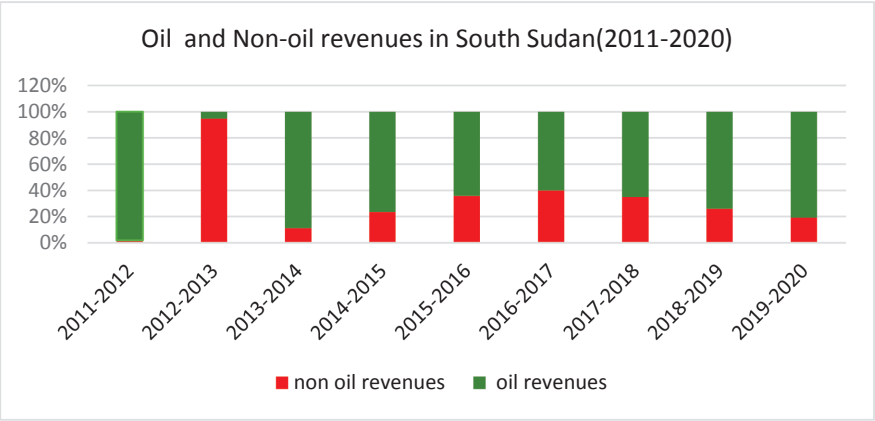


Data Source: CBOS annual report

Figure 12 Tax and non-tax revenues and oil and non-oil revenues in Sudan (1999-2017)

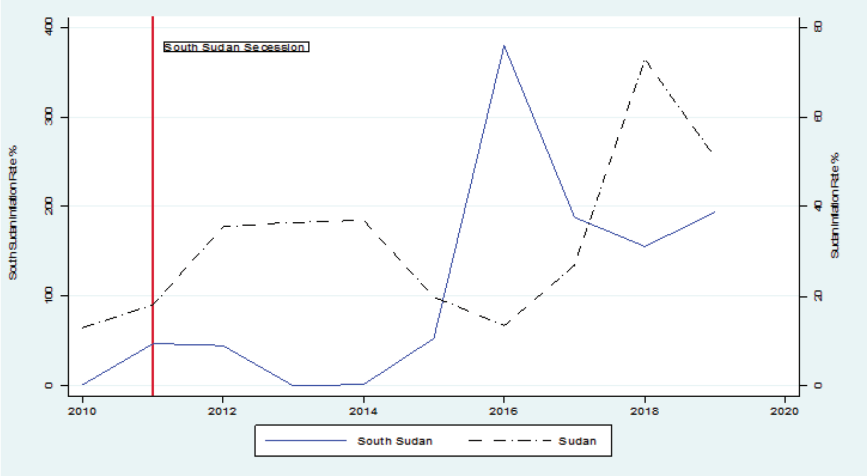
Moreover, oil has also created many structural rigidities in the Sudanese economy. These rigidities have later become the main cause of economic decline after the secession of South Sudan. The loss of 76% of the country's proven oil reserves has had a disastrous effect on growth rates. As a result, the annual growth rate declined sharply form 3.5% in 2010 to -2.0% in 2011 (World Bank). In an attempt to absorb the shocks of the oil loss, the government adopted austerity policies. The outcome of these policies was a slight improvement in the growth performance. The economy grew at positive rates of 0.5%, 4.4%, 2.7%, 4.9%, and 4.7% in 2012, 2013, 2014, 2015, and 2016 respectively (World Bank, 2019). Nonetheless, these positive rates could not be maintained despite the partial lifting of the US sanctions, which had been imposed on Sudan since 1991.The growth rate declined steadily since 2016, and the economy contracted by 2.94% ,1.66% -2.23% and -2.62% in 2016, 2017 , 2018 and 2019 respectively (Statista,2020). Inflation rates also increased sharply after the oil loss, which eroded the value of money and increased instability. The inflation rate increased form 18% in 2010 to 36% in 2012 (see figure 14 below). This economic crisis, along with the government's austerity measures, was the main driver of the general uprising that eventually overthrew the thirty-year-old regime of Omar al-Bashir. Hence, the absence of a similar income source as oil was the main reason behind the economic growth decline. The second reason is the deterioration of the sectors that were driving growth before the introduction of the oil sector, namely, agriculture and livestock.

As an oil-dependent economy, South Sudan suffers from production and price volatility. Oil is the main source of government income in South Sudan, whereas the contribution of other non-oil revenues was very limited and represented less than 20% (see figure 13 below). As can be seen in figure 15, the shutdown of oil production in 2012 led to an economic contraction of -51.5%, and inflation levels increased to an average of 47% in the same year. Even when oil production commenced after 2015, the fall of oil prices frustrated efforts of economic recovery. Hence, the economy was exposed to shocks of production, global demand, and prices. Oil was generating USD3.3 billion in revenue in 2011 and 2012, and the economy was enjoying a budget surplus. Oil revenues fell to only 500 million between 2015 and 2016 after oil production declined due to the reduction in oil prices and production (ADB). As a result, the GDP growth rate contracted from 13% in 2013 to –11% in 2016. The uncertainty created by oil prevented the influx of foreign direct investment not only in agriculture and the mining sector but also in the oil sector itself. The uncertainty in the flow of oil revenues has also prevented public investment projects, especially in the infrastructure projects, which are essential for the development of other sector and export diversification. The depreciation of the currency also led to the continuous increase in inflation rates. Inflation rates increased from 45% in 2012 to the peak of 379% in 2016 as can be seen in figure 14. Hence, the oil-driven instability prevents any efforts to achieve economic and export diversification since it increases the uncertainty over government budgets.



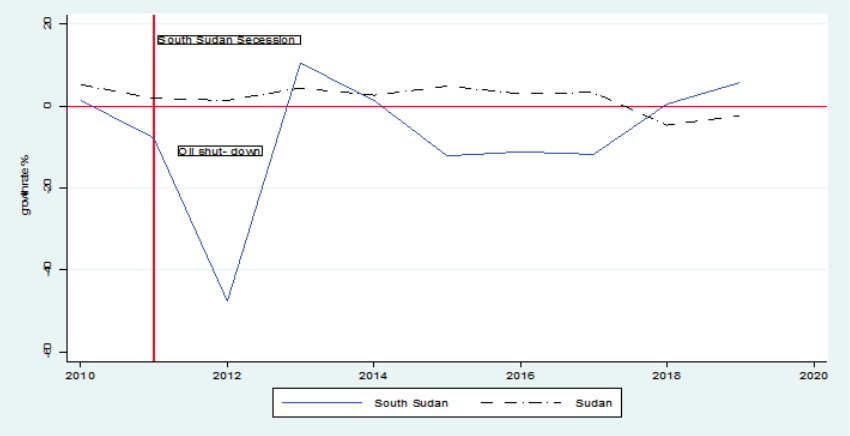
Data Source: Budget book, Ministry of Finance and Economic Planning, South Sudan

Figure 13 South Sudan oil and non -oil revenues (2011-2020)



Data Source: WDIs

Figure 14 Sudan and South Sudan Inflation Rates (2010-2019)



Data Source: WDIs

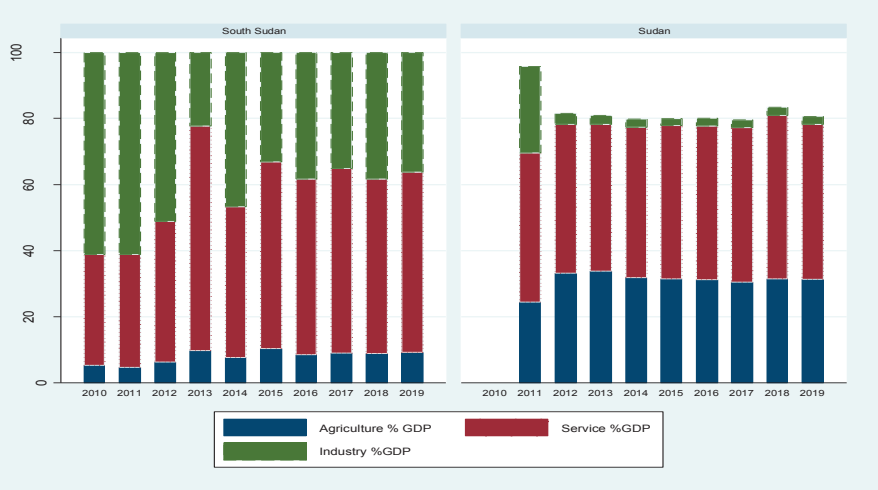
Figure 15 Sudan and South Sudan growth Rates (2010-2019)

Oil has also affected Sudan's economic structure. Prior to oil production, Sudan's economy was dominated by agriculture. Historically, agriculture accounted for an average of 38% of GDP during the period between 1960 and 1981(WDIs). The agricultural sector also employed 70% of the labor forces in Sudan. However, since 1983, it has been overtaken by the services sector which had dominated the GDP with an average share of 44% until the introduction of oil in 1999. Furthermore, as the oil sector was growing, the role of agriculture in the economy was gradually declining. The average participation of the agricultural sector in the GDP decreased to the level of only 24% of GDP between 2000 and 2011.

The second contributor to Sudan's GDP is the service sector. This sector witnessed huge development after the oil production. This is because oil crowded out investment from tradable agricultural commodities to the non-tradable service products, especially construction and communication. This sector was growing at an average of 10% during the period between 2000 and 2011. Sudan's economy is also characterized by limited contribution of the manufacturing sector. The average share of manufacturing in GDP did not exceed 3% between 1960 and 2000 (WDIs). However, the manufacturing sector grew by an average of 4% between 2000 and 2010. Considering these patterns, it could be concluded that that oil revenues did not participate in the development of other sectors. In fact, the introduction of oil crowded out resources and led to the negligence of other productive sectors, particularly agriculture and manufacturing.

The secession of South Sudan brought back the agricultural sector as a potential substitute for oil. The government introduced the agricultural revolution programme. The programme included a number of reforms that were meant to increase the share of agriculture in both GDP and exports. The sector has been promoted after 2011, and its participation in the GDP subsequently increased from 24% in 2011 to 32% in 2019 (WDI, 2020). The share of agricultural commodities in the country's total merchandize exports also increased from 13% in 2010 to 40% in 2017 (OEC, 2016). Furthermore, the sudden reduction of oil reserves has also stimulated the promotion of the mining sector, particularly gold. Indeed, gold has emerged after 2011 as the main source of foreign earnings for Sudan. The share of gold in Sudan's exports increased from 2.6% in 2000 to 40% in 2017(OEC, 2020). On the other hand, the share of crude oil decreased from 70% in 2001 to 10% in 2017. Thus, it can be concluded that the loss of oil reserves resulting from the secession of South Sudan in 2011 prompted the diversification of exports in Sudan's economy replacing oil. This means that Sudan is on the right track to develop its agricultural resources and integrate them into agro-industries.

Similar to Sudan, South Sudan's economy is also a primary sector economy. However, the uneven distribution of oil reserves in Sudan made South Sudan the land in which 70% of Sudan's total proven reserves are located. This has had a determining role in making South Sudan's economy an oil-dependent economy. Nonetheless, South Sudan also has huge economic potentials both in agriculture and mining. However, the average contribution of the agriculture sector to the GDP did not exceed 8 % between 2011 and 2019 (WDIs). Moreover, since the independence of South Sudan in 2011, the share of these two sectors of GDP has not witnessed any significant development. This lack of development can be attributed to the shortage of skilled labor and the lack required infrastructure. Consequently, South Sudan has a very concentrated export mix. The participation of oil and mining sectors represent an average of 99% of South Sudan's total exports compared to an average of only 0.23% for other non-oil exports over the period of 2012-2017(OEC). Those exports are sesames seeds, vegetables, and gums. The manufacturing sector in South Sudan also makes a very limited contribution: the share of manufacturing in merchandize exports is estimated at an average of only 0.2%. All these factors will make it more challenging for South Sudan to achieve export diversification, at least in the short- and middle-term. Consequently, the country is expected to depend on oil as the main growth driver and the main source of foreign exchange in the decades to come.



Data source: WDIs

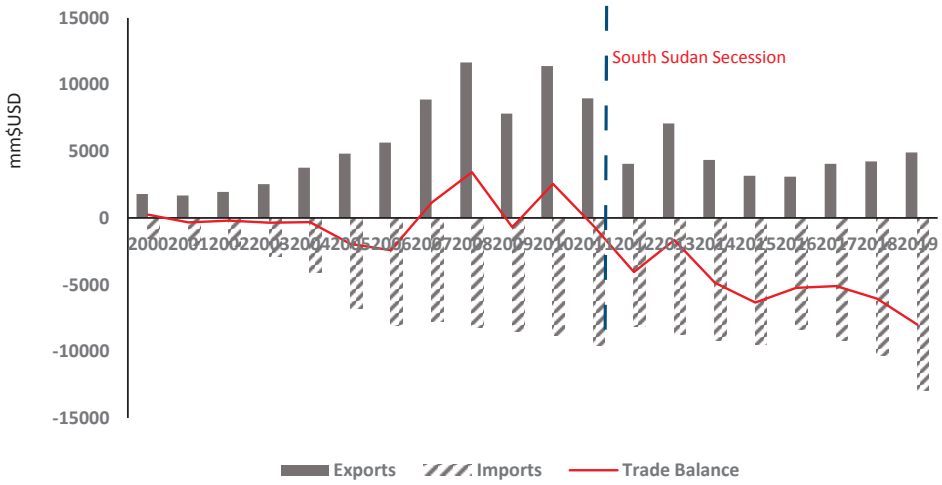
Figure 16 Sudan and South Sudan sectoral share in GDP (2010-2019)

Oil has had a positive impact on Sudan's foreign trade. The economy achieved surplus periods in the trade balance for the first time in many decades in 2000, 2008, and 2010. However, these trade gains were unstable due to the unsteady nature of oil prices and revenues. Therefore, despite the trade gains made by oil revenues, it also increased trade balance susceptibility to international prices and demand variations. Moreover, the oil-driven increase in total exports has coincided with even a larger increase in total imports. According to Nour (2011), the share of exports in GDP grew form 7% in 1996 to 14 % in 2006, whereas the share of imports in GDP remained higher, at 16%, during the same period. This increase in the country's imports was induced by two factors. The flow of final products due to the appreciation of Sudanese currency and the imports of oil exploration and development equipment. Therefore, the oil-dependent trade balance was not secure enough to endure the sudden loss of oil revenues. As a result, Sudan's trade balance declined sharply after the secession of South Sudan, as can be seen in figure 17 below. This reflects the absence of an equally remunerative substitute for oil. It also shows the crowding-out effect of oil on other productive sectors and the lack of export diversification. Figure 10 also demonstrates that the trade surplus gained during oil production is less than the deficits caused later by the oil loss.

Similar to Sudan, oil revenues have also a positive impact on South Sudan's trade balance. As can be seen in figure 18 below, oil exports led to a trade surplus of more than USD 5 billion in 2010 and 2011. However, the oil shut-down of 2012 reflected the sensitivity of south Sudan's trade balance to the oil revenues. The absence of oil revenues led to deficits of USD 5 billion and USD 3 billion in 2012 and 2013 respectively. However, although the trade balance started to recover s lowly after 2014, it

registered a trade deficit of $1 billion in the following years. Moreover, to a large extent, this can be attributed to the recent reduction in international oil prices. Hence, the trade balance of the young state shows high oil dependency and high vulnerability to external shocks, which highlight the importance of export diversification to overcome this challenge in the future.

In line with the resource cures prediction, oil has made an insignificant impact on unemployment rates. Unemployment rates were almost constant at 16% throughout the period of oil production, as can be seen in figure 19 below. Nonetheless, unemployment rates showed a gradual decline during this period and reached its lowest level in 2010. After 2011, unemployment rates increased again with the decline in economic growth caused by the oil-loss shock. Figure 19 shows that the average unemployment rate between 2011 and 2019 was 13%. A similar pattern can be seen in unemployment rates in South Sudan. Oil exports have had limited impact on unemployment, and this mild effect is attributed to two main factors. First the structure of the industry itself. Oil industry is sophisticated and capital intensive, so it does not create many jobs. Furthermore, oil is a point resource, and hence, it does not create forward and backward linkages. The second factor is the negative impact of oil dependence on export diversification: the reduction in export diversification led to the reduction in the volume of exports and eventually a reduction in employment given the fact that the external sector has a big capacity for job creation in comparison to other economic sectors.

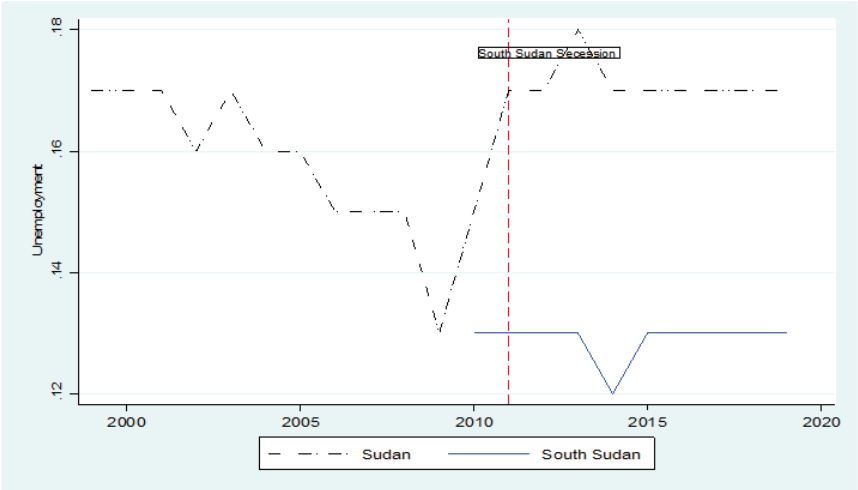


Data source: WDIs, trading economics &CBOS annual report

Figure 17 Sudan Export, Imports and Trade Balance (2000-2019)

Data source: WDIs, trading economics &CBOS annual report

Figure 18 South Sudan Export, Import and Trade Balance (2011-2016)



Data Source: Trading economics and statista

Figure 19 Sudan and South Sudan Unemployment (1999-2019)

4. Conclusion and Policy Recommendations

The uneven geographical distribution of oil resources gains a vital importance in the case fragile states. In such cases, the economic impact of oil can play a determinant role in tearing these countries apart. Sudan and South Sudan provide a very unique experience of a single state that has separated into two; one of them lost its oil reserve and the other gains these reserves. The loss of oil reserves in Sudan and the gain of oil reserves in South Sudan have serious consequences on both countries' economies. This descriptive study has used the recent data of both countries to assess the impact of oil reserves transfer between both countries on their economic stability, export diversification, and institutions. The analysis shows oil has had a long-lasting impact on Sudan's economy, and that this impact is deep enough so that it still affects the ability of the country to overcome the shock of oil loss. Oil dependence created structural rigidities, which, in turn, hinders macroeconomic stability consequently, growth rates deteriorated sharply and the economy contracted at an average of 2%. Inflation rates soared to unprecedented rates and hit the level of 300% based on recent reports by the IMF. The unemployment rate increased sharply to reach the level of 16% and the budget and trade deficits reached a level of 5% GDP. Moreover, oil has intensified the poor quality of institutions, expanded the spread of corruption, and increased the patronage and rent-seeking behavior. Furthermore, the analysis demonstrates that oil has negative impact on export diversification as agricultural exports were deteriorating constantly as crude oil exports were increasing rapidly. Nonetheless, the analysis shows that the secession of South Sudan in 2011 was a turning point that has stimulated economic, political and institutional reforms. In an attempt to overcome the aftermath of oil loss, the government implemented some important reforms that have helped the economy to achieve some recovery. The adopted reforms aimed to promote agriculture together with the institutional and economic reforms have helped the economy to restore its positive growth rates. This has been reflected in the increase in the export diversification. As a result, the HHI has decreased considerably, reflecting more diversified export mix for Sudan in the post-oil era Furthermore, the economic hardships were the main driver for the last public upheaval that eventually toppled the 30-year-old totalitarian and corrupt regime in 2019. However, although the economy has still a very long journey to go, these reforms and political changes will eventually improve the institutions, grant the democratic transformation, and increase export diversification and economic stability.

In contrast to the impact on Sudan's economy, the transfer of oil resources flooded South Sudan with huge amount of revenues. And despite country's agriculture and mining potentials South Sudan has a premature oil dependence. Currently, oil represents 99% of the new state export mix. This makes the economy highly vulnerable to local production as well as international prices and demand shocks as has been reflected by the oil shutdown in 2012. This incident caused the contraction of the economy by 51% and increased the inflation rates substantially to hit the level of

347% in 2013. The economic performance of South Sudan's institutions also shows rent-seeking behavior that has led to the deterioration of the country's institutions. Moreover, South Sudan suffers from the lack of infrastructure that is required to promote other economic sectors, namely agriculture, fisheries and mining; in fact, huge amounts of investment are required to build this infrastructure. Together, these factors prevent export diversification. As a result, the HHI of South Sudan has increased after 2011 and has reached the level of 1. Therefore, it could be concluded that the sudden influx of the oil resource to South Sudan hindered the development of other productive sectors and led to a premature oil dependence. This may abort the country's future efforts to achieve economic stability, export diversification, and institutional advancement.

Given the above discussion, some policy recommendations can be drawn to highlight the potential pathways for both economies to achieve economic stabilization, export diversification, and institutional promotion.

First: In order to achieve macroeconomic stability, both countries have to adopt fiscal and monetary policies that can prevent high and volatile inflation rates and exchange rates volatilities. These policies include the reduction of budget deficit and deficit financing. This can play an important role in reducing inflation rates and hence allow more domestic savings and boosts investment. Regarding exchange rate fluctuations, it is important to remove multiple exchange rates. This can be achieved by unifying the official and black-market rates. Moreover, policies should also be adopted that can encourage the flow of foreign direct investment, especially foreign direct investment that can enhance technological capabilities.

Second: Based on the paper findings, export diversification is crucial for both countries economic growth and development. Sudan needs to diversify its economy to overcome the drawbacks of its oil reserve loss. Similarly, South Sudan needs to adopt a more diversified export mix to hedge against external oil prices and demand shocks. However, for both economies, agriculture and livestock are the most potential sectors to achieve export diversification. Nonetheless, these sectors are facing serious challenges, namely low productivity and structural rigidities. To improve the productivity of the agriculture and livestock sectors, both countries have to invest in expanding agricultural infrastructures, increase the usages of fertilizers, and increase the private sector participation in the agricultural investment. Furthermore, both countries also need to implement policy reforms in order to improve the performance of the agricultural sector. These policy reforms should focus on land ownership and production relationships policies as well as supporting the future management of livestock.

Third: To enhance export diversification, both governments should also adopt policies that can improve their international trades. These polices include expanding the access to credit, improving investment law to avail more protection for investors,

and removing restrictions on imports to achieve more trade openness. Additionally, the Sudan and South Sudan governments should also increase educational investment to build up the human capital required for export diversification.

Fourth: Huge reforms are also required to improve the institutional quality in both countries. Institutions should be improved to decentralize the economy. Historically, the institutional system favored the centralization of both power and wealth. This type of institutional system represents the center and ignores the peripheries, and oil has only intensified these malfunctioning institutions. The government has to adopt policies that reduce the control of the center on the economy and give more economic autonomy to the peripheries. Transparency and anti-corruption policies are also of great importance to improve the investment environment and attract FDI. These policies are also important particularly in the extractive sector, namely the oil and gold industries, to reduce patronage and rent-seeking behavior.

Future studies can address in more detail the impact of oil on institutions, inflation, and exchange rates in Sudan and South Sudan.

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CHAPTER 5 OIL, EXPORT DIVERSIFICATION, AND ECONOMIC GROWTH IN SUDAN: EVIDENCE FROM A VAR MODEL[30]

Abstract

There is an extensive literature demonstrating a positive link between export diversification and economic growth. In parallel, the so-called resource curse thesis often introduces export concentration as an important mechanism curtailing growth in oil-rich countries. Our analysis contributes to this literature by empirically investigating (with the use of a VAR model using annual data between 1960 and 2018) the interaction between oil dependence, export diversification, and economic growth for Sudan. To our knowledge, this is the first empirical analysis that studies in details the relationship between oil, export diversification, and growth for the Sudanese economy, especially in light of the substantial drop in oil dependence since the 2011 secession of South Sudan. Consistent with the resource curse literature, we find that oil rents appear to have a statistically-significant and negative (although contemporaneous rather than long-term) effect on export diversification. However, we find no evidence of a statistically significant impact of either oil dependence or export diversification on growth either in the short or long term. An extension of the VAR model including institutions (captured by a rule-of-law index) also provides no empirical support of an institutional resource curse.

Keywords**:** *Sudan; Vector Autoregressive Model; Resource Curse; Oil; Export Diversification; Growth; Institutions*

1. Introduction

There is an extensive theoretical and empirical literature linking economic diversification to enhanced economic growth prospects. Several scholars claim that export diversification, for instance, can be conducive to sustainable growth by reducing the macroeconomic impact of market volatility and by reducing exposure to price/production shocks associated with specific commodities (see Bleaney and Greenaway, 2001; Ghosh and Ostry, 1994; Koren and Tenreyro, 2007). Others also argue that diversification enhances long-term growth since it allows the utilization of multiple production factors, facilitates the introduction of new economic activities, and prevents revenue volatility and external events from restricting employment opportunities (see Albassam, 2015; Alhowis and Al-shihri, 2010; Auty, 1994; Hesse, 2008). Several studies also establish a positive link between innovation and diversification

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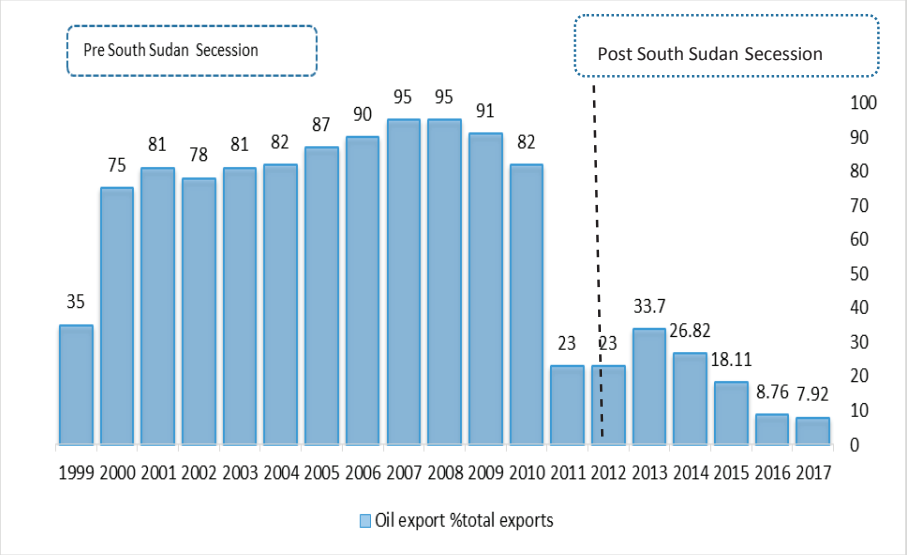
since the latter tends to stimulate competition for scarce resources and development of new products. In other words, firms in markets with little diversification, especially in economies with excessive reliance on unprocessed primary commodities with little differentiation, have little incentive to innovate as a means to sustain their market share (see Klinger and Lederman, 2009). Herzer and Nowak-Lemann (2006) also emphasize the additional dynamic learning-by-doing productivity spillovers that arise when firms specialising in different sectors establish contacts with foreign purchasers and partners over a broader range of products. Some political economy scholars also link diversification to better institutions. They see economic diversification as preventing the concentration of power in the hands of few actors, with multiple economic stakeholders instead demanding accountable and transparent administrations (Acemoglu and Robinson, 2012; Bjorvatn et al., 2012; Dunning, 2005; Olander, 2019). Naturally, there can also be reverse causality running from income levels to export diversification patterns – during the early stages of economic development, low-income levels, and the corresponding limitations of skills and resources can hinder the transition to more diversified export structures (Fonchamnyo and Akame, 2017; Papageorgiou and Spatafora, 2012).

At the same time, scholars working on the developmental effects of the extractive industry have highlighted the limited export diversification often observed in mineral-dependent economies (Alsharif et al., 2017; Bahar and Santos, 2018; Omgba, 2014). In other words, the lack of diversification is presented within this literature as a possible transmission channel of the so-called resource curse (i.e. the tendency of mineral-rich nations to underperform in long-term economic growth). A booming mineral sector often reduces export diversification through Dutch disease effects (inflationary pressures, loss of competitiveness, wage premia in the extractive sector; see Corden and Neary, 1982; Harding and Venables, 2016; Ross, 2019). Export concentration then worsens the growth prospects of mineral-dependent economies by further exacerbating their vulnerability to external price shocks and international market volatility and discouraging foreign direct investment (van der Ploeg and Poelhekke, 2009). Furthermore, excessive economic dependence on the mineral sector enhances rent-seeking and frustrates the development of a pro-development institutional framework based on accountability and transparency (Baland and Francois, 2000; Deacon and Rode, 2015; Tsui, 2010).

Our analysis contributes to this literature by empirically investigating (with the use of a VAR model using annual data between 1960 and 2018) the interaction between oil dependence, export diversification, and economic growth for Sudan. To our knowledge, this is the first empirical analysis that studies in detail the relationship between oil, export diversification, and growth for the Sudanese economy, especially in light of the substantial drop in oil dependence since the 2011 secession of South Sudan. Significant oil production started in 1999, during the presidency of Omar Al-Bashir, whose 30-year authoritarian regime started with a military coup in 1989. Oil exports grew steadily and accounted for the vast majority of total exports

in the 2000s (more than 90% since the mid-2000s, see Figure 1 and also Nour, 2011). Between 1999 and 2011 (i.e. during the years when Sudan was still in control of the oil fields currently located in South Sudan), the economy grew fast at an average rate of 5.8% (and faster than the pre-oil extraction period, when, in comparison, average growth was about 1% lower since the early 60s). During the same period, growth largely remained positive and stable. As the oil sector grew to dominate exports, the economy's vulnerability to external price shocks also increased (e.g. with 2010 being the first economic contraction since the early 90s, as a result of the oil price collapse in the preceding year). The secession of South Sudan in 2011 triggered a major economic shock with a loss of approximately three quarters of all known oil reserves. As a result of this, Sudan's oil dependence decreased substantially and abruptly, however, with no other sectors able to compensate for the loss of oil revenues (with average growth since 2011 being close to 2%, i.e. a third of the corresponding rate during the 1999-2011 period). This was largely attributed to the absence of earlier policies aiming at diversifying the economy and export structure during the years of the oil boom or attempting to revive traditional sectors that were competitive prior to the oil-boom years, such as agriculture and livestock. At the same time, Sudan has been consistently scoring low in international rankings of institutional performance, a common feature of many Sub-Saharan mineral-rich economies (Dwumfour and Ntow-Gyamfi, 2018). Rampant corruption and limited rule of law may have also limited growth prospects and stifled ambition for an alternative development model based on export diversification and private entrepreneurship.

Section 2 presents an overview of the literature on mineral dependence and economic diversification. The first part of Section 3 presents our data and methodological approach; the second half of Section 3 presents the results of our VAR analysis. Consistent with the resource curse literature, we find that oil rents appear to have a statistically-significant and negative (although contemporaneous rather than long-term) effect on export diversification. However, we find no evidence of a statistically-significant impact of either oil dependence or export diversification on growth either in the short or long run. An extension of the VAR model including institutions (captured by a rule-of-law index) also shows no empirical support of an institutional resource curse. Section 4 concludes and offers recommendations for future policies.



Source: World Development Indicators (2020)

Figure 1 Sudanese oil exports in total exports (1999-2017)

2. A Brief Review of the Literature on Minerals and Economic Diversification

While trade theory typically emphasizes the benefits of specialization in those export commodities for which countries have a comparative advantage (based on their relative abundance of certain production factors), excessive reliance on the extractive sector can be counterproductive. Already in the early 50s, Prebisch-Singer (1950) highlighted the notion that resource-dependent economies experience long periods of declining terms of trade between primary commodities and manufactured goods (see also the study by Harvey et al., 2010). In addition, an initial resource boom (triggered by new discoveries or a sudden increase in prices) is likely to reduce export diversification through the Dutch disease effects (Edwik, 2007). The associated positive income shock can trigger inflationary pressures that reduce the competitiveness of other export sectors or crowd-out their production when production factors receive higher rewards in the extractive sector (see Corden and Neary, 1982; Harding and Venables, 2016). Indeed, much empirical work within the so-called resource curse literature highlights the limited export diversification often observed in mineral-dependent economies (Alsharif et al., 2017; Bahar and Santos, 2018; Omgba, 2014). This can have significant repercussions for growth when a dominating extractive sector comes at the expense of other economic activities characterized by stronger learning-by-doing externalities (Aizenman and Lee, 2010; Krugman, 1987). A dominant mining sector that dwarfs all other economic activities

is likely to frustrate incentives for innovation either because production becomes concentrated across fewer firms with little competition over domestic inputs or by limiting knowledge transfer from abroad (that is more likely to take place when more sectors are open to trade and avenues of information exchange become available; see Herzer and Nowak-Lemann, 2006; Klinger and Lederman, 2009). Given the excessive volatility in international mineral prices, an almost exclusive dependence on mining rather than a more diversified export structure increases vulnerability to external price shocks, discourages foreign direct investment and translates into recurring macroeconomic boom-and-bust cycles (Auty, 1988; Heidrian and Green, 1989; Humphreys et al., 2007; van der Ploeg and Poelhekke, 2009). Along these lines, Murshed and Serino (2011) explore the pattern of export specialization and economic growth in a panel dataset of resource-rich economies for the period 1960-2005 and confirm the growth-retarding effect stemming from a combination of an extensive extractive sector and lack of diversification in exports.

In general, less diversified economies are likely to develop inferior institutional frameworks; a more equitable distribution of power across multiple sectors and stakeholders enhances the demand for accountability, transparency and prudent governance (Acemoglu and Robinson, 2012; Dunning, 2005). The negative effect on institutions can be even more pronounced in the case of excessive economic dependence on minerals (Deacon and Rode, 2015; Frankel, 2010; Isham et al., 2003; Lederman and Maloney, 2007; Tsui, 2010). As such, mineral wealth can incentivize politicians to dismantle well-functioning institutions in order to facilitate access to the rents, increase rent-seeking competition among different stakeholder groups that vie for control of the resource revenues, and create short-sighted governments that face reduced accountability for their actions as a result of excessive rent redistribution and lower taxation (see Besley and Persson, 2010; Ross 2001, 2015; Vahabi, 2018). In addition, while economic diversification can lead to institutional improvements, this can be conditional on the type of diversification (e.g. if diversification is still based on alternative resource-dependent activities) as well as on existing elite incentives that might favour the status quo (Wiig and Kolstad, 2012). Spending on patronage supported by the abundance of mineral rents can also allow low-quality public officials to remain in public office for long periods of time (Brollo et al., 2013). Subsequently, this so-called institutional resource curse can impact negatively on the long-term growth prospects of mineral-dependent economies (Williams, 2011). Some studies, on the other hand, emphasise the conditioning role institutions can have in the minerals-growth nexus rather than looking at the effect of mineral resources on institutional quality (e.g. see Kaffine and Davis, 2013; Mehlum et al., 2006; and Robinson et al., 2006). Similarly, Albassam (2015), in his assessment of the development plans adopted by Saudi Arabia's government between 1970 and 2013, concludes that poor institutions inhibited attempts to diversify away from oil.

Other studies examine the possible impact of institutions on economic diversification. For instance, Starosta de Waldemar (2010) finds a negative effect of rent-seeking activity on export diversification (based on a highly disaggregated export data of more than 5,000 commodities). Karshenas and Hakimian also blame the combination of rent-seeking, lack of democratic accountability, and oil rents for the limited economic diversification of the Iranian economy. Moreover, Ahmadov (2012) uses a cross-country dataset of 170 resource-rich countries for the period between 1932 and 2010 and finds that institutional quality prior to the resource discovery has strong impact on a resource rich country's ability to achieve diversification. Similarly, Alsharif and Bhattacharyya (2019) also confirm that strong democratic institutions moderate the general tendency of oil-rich economies to experience reduced diversification due to the overall contraction of the non-extractive sector.

2.1 The Case of Sudan

Despite the substantial impact of the extractive sector on the Sudanese economy (both prior and following the secession of the oil-rich South Sudan), very little attention has been dedicated to exploring in an analytical way the associated structural transformation (and concomitant changes in export diversification). Nour (2011), in her qualitative study, claims that while oil accelerated growth in Sudan, it also induced a subsequent lack of export diversification. Khalifa presents a simple econometric model finding a crowding-out effect of the extractive sector on agricultural exports for the pre-secession period (see also Gadkarim, 2010 for similar results). One of the few domestic sectors that benefitted from oil extraction appears to be the domestic non-tradeable service sector (Hassan and Abdullah, 2014); similar to what Dutch disease theory would predict, the positive income shock stemming from oil increased the demand for domestic services (e.g. of the hospitality sector) and reduced the size of non-oil export activity.

3. Oil and Export Diversification in Sudan – Main Analysis

3.1 Theoretical Discussion

The negative impact of resource rents on growth is the core theoretical argument of the resource curse thesis. However, a universally accepted explanation of the phenomenon has been absent so far. Nonetheless, a number of transmission mechanisms have been identified in the literature as the theoretical justification for the underperformance of the resource-abundant countries in comparison to the resource-poor ones. The most powerful explanation to date is the crowding out effect of the resources revenues. Resources and especially oil are said to crowd-out activities that are vital to the economic growth. Sachs and Warner suggest that oil increases the demand for the non-tradable goods and services and, hence, crowds-out the tradable ones. This in turn leads to a premature deindustrialization since the

increase in the demand for non-tradable goods increases their prices and the wages in their market, thereby crowding out the resources, pushing them from the tradable sector to the non-tradable sector. Consequently, tradable sectors, and particularly the manufacturing sector, face high wages and high costs of input goods. Over time, this leads to a premature deindustrialization as the manufacture industries find it increasingly difficult to sustain their businesses. The ultimate result is the diminishing of the manufacturing and other tradable sectors. And given the importance of manufacture for economic growth, the contraction of the manufacturing sector negatively affects growth in the long-run. This process has been given the name of the Dutch disease in the literature of the resource curse.

Export diversification is introduced as one of the explanations of why some countries grow faster than others. The major explanation of the positive links between export diversification and growth is the argument that export diversification reduces the vulnerability of these economies to the external shocks by diversifying their export basket (see Herzer and Nowak Lemann, 2006). This explanation gains more logic in the context of resource-rich countries. The fact that the majority of resource-rich countries show high dependency on oil exports as the main source of export revenues, strongly suggests that the lack of export diversification should be classified as one of the transmission channels of the resource curse. High dependency on resource rent creates uncertainty on export revenues and government budget revenues. This delays and hinders the government's expenditure on development projects, which are essential for the export promotion. Additionally, the as resource rent increases the cost of the exports and, hence, their competitiveness decreases in the international markets. Furthermore, oil rents also crowd out resources from the manufacturing sector and reduces their participation in the resource export mix. Resource rents are also said to have a negative impact on human capital accumulation and particularly the growth of the skilled labor forces. A skilled labor force is vital for the promotion of exports since it helps these countries to add sophisticated goods to their export mix. The accumulation of human capital requires huge government expenditure on education, which is not the case in the majority of resource-rich countries.

The narrative of political scholars on the resource curse is based on the negative impact of resource rent on resource-rich countries' institutions. The theoretical explanation of this negative relationship is based on the so called Institutional Disease. According to this argument, resource rents encourage and intensify rent-seeking behavior, and this leads to the concentration of the rents in the hands of the incumbent groups, thereby leaving very few resources for development investment. These incumbent groups always face a trade-off between investing in infrastructure that is essential for economic diversification and capturing the rent. And since the cost of capturing and distributing the rent among a small incumbent group is less than the cost of investing in enhancing economic growth, a small amount of resources is always allocated to diversify the economy, consequently, impeding

growth in the long run. Oil rents are also blamed for increasing and intensifying corruption. This is because resource rents erode institutions over time. The absence of strong institutions expands the spread of corruption activities, such as bribery and use of power for personal gains. Resource rents are also blamed for inhibiting democracy in resource-rich countries. The democratic system requires high degrees of transparency and accountability, and it is these two requirements that reduce the ability of the rent-contesting groups to capture the rent. Democracy has a positive link with economic growth, and, hence, the absence of democracy hiders growth in the long run.

Given the above discussion, it could be said that these three factors, resource rents, growth export diversification, and institutions are strongly linked and that their interaction both in the short and long run determines the performance of resource-rich economies. In the next section, using a time-series analysis of between 1960 and 2018, we will investigate how these three variables interact and determine the performance of the Sudanese's economy

3. 2 Data and Estimation

We make use of a Vector Autoregressive (VAR) model (using annual data between 1960 and 2018) to examine the interaction between oil dependence, export diversification, and economic growth for Sudan. In addition, we run a series of Granger causality tests to establish the time ordering of effects that need to be adopted for our VAR estimations. Based on the VAR estimates, the Orthogonalized Impulse Response (OIRFs) functions will allow us to assess the magnitude and statistical significance of impacts over time, arising from any shock to the system. The set-up of our VAR model aims to test empirically the relationship between oil dependence, economic growth, and diversification for the case of Sudan (i.e. evaluate whether oil rents have a negative impact on the other two variables, as is often suggested in the resource curse literature; see Alsharif et al., 2017; Bahar and Santos, 2018; Gylfason and Zoega, 2006; Murshed, 2004, 2018). The case of Sudan is a particularly interesting case to examine given the significant dependence of the economy on oil rents until 2010 and the subsequent decline of the oil sector thereafter.

For this purpose, the following system of equations is estimated as part of our VAR model:

$$lpcgdp_t = \sigma + \sum_{i=1}^{k} \beta_i \, lpcgdp_{t-i} + \sum_{i=1}^{k} \varphi_j HHI_{t-i} + \sum_{i=1}^{k} \delta_n \, oilrent_{t-i} + \mu_{1t} \qquad (1)$$

$$HHI_t = a + \sum_{i=1}^{k} \beta_i \, lpcgdp_{t-i} + \sum_{i=1}^{k} \varphi_j HHI_{t-i} + \sum_{i=1}^{k} \delta_n \, oilrent_{t-i} + \mu_{2t} \qquad (2)$$

$$oilrent_t = c + \sum_{i=1}^{k} \beta_i \, lpcgdp_{t-i} + \sum_{i=1}^{k} \varphi_j HHI_{t-i} + \sum_{i=1}^{k} \delta_n \, oilrent_{t-i} + \mu_{3t}, \qquad (3)$$

where *lpcgdp* corresponds to the natural logarithm of real GDP per capita values (with 2010 as the base year), *oilrent* refers to the value of oil rents as a share of the

Sudanese GDP, *HHI* is the Herfindahl-Hirschman index of export concentration, and μ's captures the error component of each equation. As an extension of our analysis, we also estimate an extension of the VAR model including institutions (captured by a rule-of-law index) to see whether there is empirical support in favour of an institutional resource curse for Sudan (again in line with several papers in the literature that suggest that mineral rents may erode institutional quality (e.g. see Corrigan, 2014; Dunning, 2005; Ross, 2015; Stevens and Dietsche, 2008; Vahabi, 2018). A detailed description of all variables with summary statistics is provided in Appendix 1. Data on GDP per capita and oil rents are provided by the World Development Indicators (WDIs) database of the World Bank (2020). Data on the rule of law are available from the Varieties of Democracy (V-Dem) project, led by the Kellogg Institute (University of Indiana) and the University of Gothenburg (V-Dem, 2020): the rule of law index takes values between 0 and 16 (with higher values corresponding to better performance in this institutional domain).[31] The Herfindahl-Hirschman index of export concentration (HHI) was constructed based on WDI data on the sectoral composition of exports, using the following formula:

$$HHI = \sum_{i=1}^{n} x_i^2,$$

Where the x_i is the percentage share of each category *i* of export commodities (metals, oil, agriculture, food, manufactured commodities etc) in Sudan's total merchandised exports.

3.3 Analysis and Results

3.2.1 Test of Stationarity and Test of Co-integration

As a first step, we check for the stationarity of the variables entering our VAR system. As can be seen from the unit root tests presented in Table A2 of Appendix 2, all variables (in levels) appear to be non-stationary. We, hence, generate the first-difference for all variables and control once again for stationarity (Table A3 of Appendix 2); since the first differences of all variables are stationary, it is the latter set of variables that will be included in our VAR specifications. Secondly, we need to decide on the optimal lag length of our VAR system. There are several selection-order statistics and criteria to help decide on the appropriate lag length; these do not always agree with one another due to the importance they assign to model complexity vs. goodness of fit. Given the relatively limited time coverage of our time series data, we opted for one lag, as is also suggested by the vast majority of criteria (with the exception of the Schwarz's Bayesian information criterion (SBIC) that is in

[31] We also subsequently substituted the rule of law index with alternative institutional indicators from the V-DEM dataset (e.g. the executive corruption, regime corruption and clientelism indices; see V-Dem 2020). The institutional indicators are highly correlated with one another, and, as a result, there are small differences in the VAR estimates and corresponding OIRFs (results available from the authors upon request).

favor of no lags (see Appendix 3, Table A4). Next, we need to characterize the temporal relationships in our VAR model (i.e. some disturbances may impact some of the endogenous variables earlier than others). The second step was to select between the VAR and the VECM models in order to investigate whether the relationships among these variables hold also in the long-run or are only limited to the short-run. The results of the Johnson co-integration test show that we cannot reject the null hypothesis of no co-integration. Accordingly, we select to go with the VAR Model as our co-integration test supports the significance of these relationships only in the short run since there is no co-integration between these variables in the long run.

3.2.2 Time ordering of impulses

Granger causality tests help us decide on the temporal ordering of such effects (these are presented in Appendix 4, Table A5). Results are more supportive of a recursive order, where the effect of oil rents on diversification (HHI) precedes any reverse effects in the opposite direction; the other Granger-causing effects appear to be statistically insignificant. For this reason, we adopt the following ordering for our VAR model: *oilrent → HHI → lpcgdp.*[32] The VAR estimates are presented in Table 1. Although it is not meaningful to interpret directly the coefficients appearing in Table 1 due to the simultaneous interactions across the system of 3 equations, column (2) already provides some indicative evidence of a positive (negative) and statistically-significant link between export concentration (diversification) and past oil rents; note that column (3) suggests a relationship of the same sign (albeit less statistically significant) between oil rents and past export concentration. At the same time, although column (1) depicts a negative association between export concentration and growth, the corresponding coefficient is not statistically significant.

We also replicate the VAR estimations for the fuller specification that includes the Rule of Law variable. The Granger causality tests support a similar time ordering (institutions neither seem to Granger-cause any of the other endogenous variables nor to be Granger-caused by any of them, see Appendix 5, Table A6). Again, results are more supportive of a recursive order where the effect of oil rents on diversification (HHI) precedes any reverse effects in the opposite direction. For this reason, we adopt the following ordering for our VAR model: oilrent → HHI → lpcgdp → RuleofLaw. The VAR estimates of the fuller model with institutions are presented in Table 2. While again it is not meaningful to directly interpret the VAR coefficients, the positive (and statistically significant) relationship between oil rents and export concentration still holds. Column (4) provides no indication of an institutional re-

[32] We also experimented with alternative orderings that yielded very similar results; results available from the authors upon request.

source curse for Sudan; i.e. the coefficient of oil rents in column (4) is neither negative nor statistically significant. As a robustness check, we also re-estimated our VAR model by substituting the rule of law index with alternative institutional proxies (namely, the executive corruption, regime corruption and clientelism indices); similarly, we did not find evidence of a negative and statistically-significant relationship between institutional quality and growth (or export diversification).[33] In general, the institutional variables exhibit limited time variability over time (and are hence less likely to be influenced by or influence other endogenous variables).

Finally, we conduct a series of diagnostic tests (namely, a residual autocorrelation and a VAR stability test) to check for the adequacy of our model specification. The results of these tests (for our main model without institutions) are presented in Appendix 6. Table A7 and the corresponding Lagrange-multiplier tests provide support to a white noise error term (i.e. there is no residual autocorrelation detected). Table A8 shows that all eigenvalues lie within the unit circle, hence, suggesting that the VAR system as a whole is stable and that any shocks die out relatively quickly. The same results also hold when replicating the tests for the augmented VAR model with institutions.

Appendix 7 (Table A9) replicates our main VAR specification with the inclusion of a post-2010 dummy as an exogenous variable (i.e. a dummy variable referring to the post-cessation years of South Sudan). There are no substantial differences in relation to our earlier findings and there is still tentative evidence of a positive link between oil and export concentration for Sudan.

Table 1 VAR model results for GDP growth, HHI and oil rents

Dependent Variable	$dlpcgdp_t$ (1)	$dHHI_t$ (2)	$doilrent_t$ (3)
Constant	0.01	0.002	0.07
$dlpcgdp_{t-1}$	0.33*** (0.12)	0.17 (0.11)	-7.03 (7.44)
$doilrent_{t-1}$	0.003 (0.002)	0.005*** (0.002)	-0.28** (0.13)
$dHHI_{t-1}$	-0.05 (0.13)	-0.36*** (0.12)	13.68* (7.91)
R^2	0.13	0.22	0.12
Number of observations	56	56	56

[33] Results are available from the authors upon request.

Note: Standard errors in parenthesis. *, **, *** correspond to 10, 5 and 1% level of significance

Table 2 VAR model results for GDP growth, HHI, oil rents and rule of law

Dependent Variable	$dlpcgdp_t$ (1)	$dHHI_t$ (2)	$doilrent_t$ (3)	$druleoflaw_t$ (4)
Constant	0.01	0.002	0.12	-0.003
$dlpcgdp_{t-1}$	0.34*** (0.12)	0.17 (0.11)	-6.76 (7.4)	0.010 (0.14)
$dloilrent_{t-1}$	0.003 (0.002)	0.005*** (0.002)	-0.27*** (0.13)	0.0006 (0.002)
$dHHI_{t-1}$	-0.05 (0.13)	-0.36*** (0.12)	13.51** (7.87)	-0.05 (0.14)
$druleoflaw_{t-1}$	0.11 (0.13)	0.076 (0.11)	4.96 (7.01)	0.40*** (0.13)
R^2	0.14	0.23	0.13	0.15
Number of observations	56	56	56	56

Note: Standard errors in parenthesis. *, **, *** correspond to 10, 5 and 1% level of significance

3.3 Impulse Response Functions

As mentioned earlier, while individual coefficients of the estimated VAR system can provide indications of the sign and size of relationships between variables, it is not meaningful to interpret them in isolation (given the multiplicity of interactions captured within the system). The Orthogonalized Impulse Response Functions (OIRFs) are much more useful in that respect and allow us to measure the effect of a single disturbance (shock / impulse) of one variable on another response variable (or itself) over time, after taking into considerations all possible interactions captured by the equations of the VAR system. For instance, the OIRFs can help us assess how an oil shock (e.g. in the form of a sudden drop in oil revenues in Sudan) may affect the extent of export diversification (or other variables in the system) in the short and long term.

Figure 2 presents the impact of a one-standard deviation (close to 1.4 percentage points) oil impulse on export concentration (HHI). We observe that oil rents appear to have a statistically-significant and positive (although contemporaneous rather

than long-term) effect on export concentration. The HHI index increases by approximately 0.012 units, in line with the rise in oil rents, though with the effect decreasing in size (and statistical significance) after just one year and gradually dying out. Sudan shifted within a relatively short period of time from being an economy that had almost no oil revenues in the early 90s to one that was largely oil dependent (with oil rents accounting for about 23% of GDP by 2008); by the beginning of the 2010s, the contribution of the oil sector to the overall economy became again minimal (e.g. close to 3.5% in 2012). This suggests that an oil shock of that size (e.g. an increase/decrease of the ratio of oil rents in GDP by about 20%) would correspond to an increase/decrease of the HHI index (i.e. in export concentration) by approximately (20/1.4)x0.012 = 0.17 units.

Figure 3 depicts how per capita growth responds to an oil rent shock. While the impulse-response function is suggestive of a positive link (i.e. of a beneficial impact of an oil boom on growth), the effect is consistently statistically-insignificant. Figure 4 presents the growth impact of an export concentration (HHI) shock. While an increase in export concentration (i.e. a less diversified export structure) appears to have a growth-contracting impact, the effect is again not statistically significant. Appendix 8 (Figures A1-A6) present all other impulse-response functions of the VAR system (which again do not provide evidence of statistically-significant impulses). The impulse-response functions for the augmented VAR model with institutions (rule of law) produce very similar findings. The only statistically effect (and of almost identical magnitude to the one of the more parsimonious models, see Figure 2) is the one running from oil to HHI (results available from the authors upon request). In Appendix 9, we indicatively present some of the impulse-response graphs for the augmented VAR model. Figures A7-A9 present the 'rule-of-law impulse - HHI response', 'rule-of-law impulse - growth response' and 'oil impulse - rule-of-law response' functions respectively. None of them correspond to statistically-significant impacts.

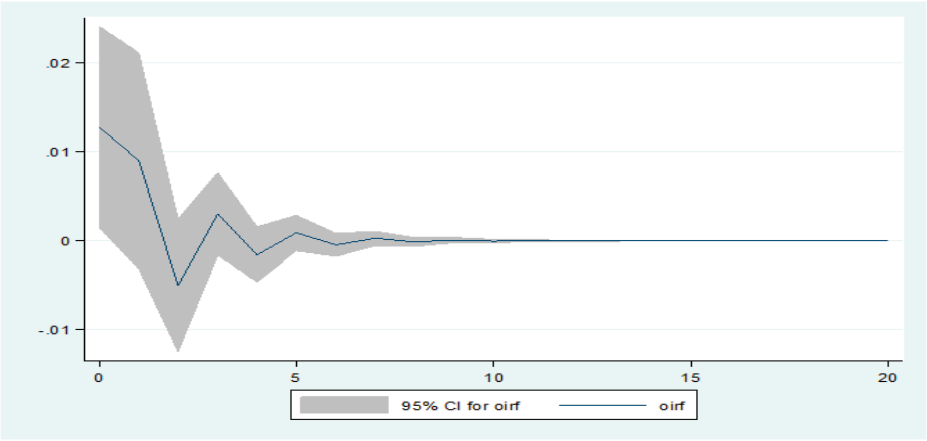


Figure 2 OIRF (oil impulse, HHI response)

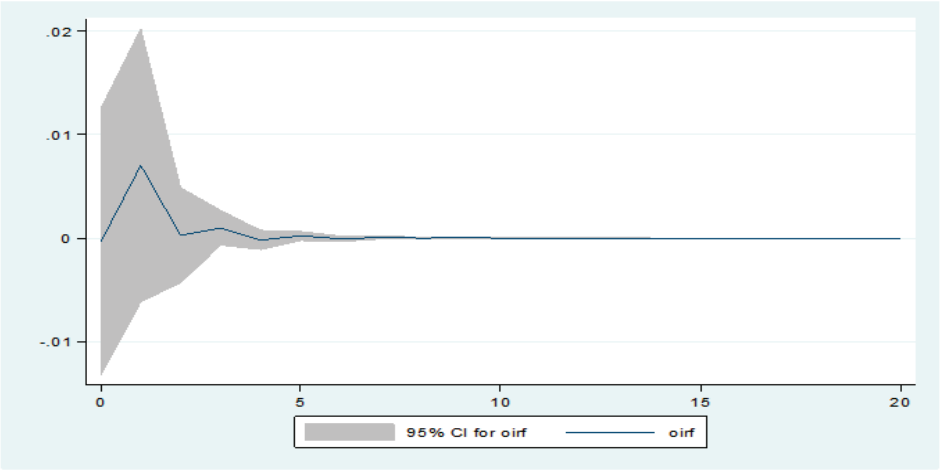


Figure 3 OIRF (oil impulse, economic growth response)

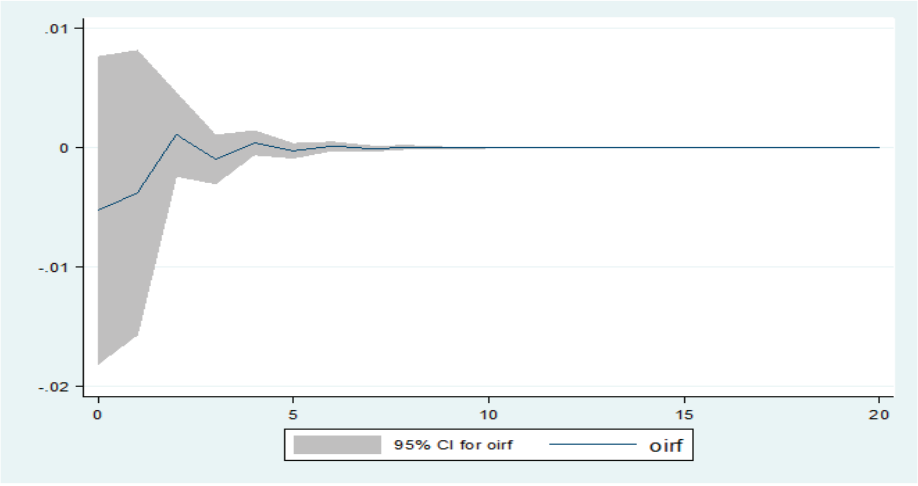


Figure 4 OIRF (HHI impulse, economic growth response)

4. Conclusion and Policy Recommendations

Many studies emphasize the importance of export diversification for sustainable long-run growth, especially in the context of oil-rich economies where the extractive sector tends to dominate the export trade. Export concentration renders oil-rich

countries vulnerable to price fluctuations, often generating macroeconomic volatility and uncertainty. In addition, Dutch disease effects in oil-rich economies typically further increase the dominance of the extractive sector at the expense of other economic activities. Our analysis has been a first attempt to examine through time-series modelling the links between oil dependence, export diversification and economic growth for the case of Sudan.

Sudan is a particularly interesting case to examine. Sudan was not always an oil-rich or oil-dependent economy. Significant oil production started in 1999 during the presidency of Omar Al-Bashir; shortly after, the extractive industry accounted for the vast majority of exports. Between 1999 and 2011 (i.e. during the years when Sudan was still in control of the oil fields currently located in South Sudan), the economy grew quickly at an average annual rate of 5.8%. However, the secession of South Sudan in 2011 rather abruptly transformed Sudan once again into a less oil-dependent economy and triggered a major economic shock given the absence of earlier successful policies to diversify the export structure. At the same time, Sudan has been underperforming in international rankings of institutional performance (a typical feature of many oil-rich nations) with widespread corruption and weak rule of law hampering the growth and entrepreneurship potential.

Our analysis contributes to the literature by empirically investigating (with the use of a VAR model using annual data between 1960 and 2018) the interaction between oil dependence, export diversification, institutional quality, and economic growth for Sudan. Consistent with the resource curse literature, we find that oil rents appear to have a statistically-significant and negative (although contemporaneous rather than long-term) effect on export diversification. However, we find no evidence of a statistically-significant impact of either oil dependence or export diversification on growth either in the short or long term; similarly, we also find no empirical support of an institutional resource curse.

The results have important policy implications for Sudan. While oil shocks influence export diversification in the short term, it is not the extractive sector to blame for the unsuccessful attempts to diversify the export structure in the medium to long term. Limited export diversification appear to be chronic problem of the Sudanese economy rather than a phenomena that is influenced by volatility in oil revenues. Oil and raw agricultural products (as well as gold production more recently) still dominate the export structure of the economy; dedicated government efforts (e.g. in the form of an agricultural-based industrialization policy) should support a more balanced export mix with participation of manufactured commodities.

This has been a first attempt to empirically examine the link between oil shocks, export diversification, growth and institutions for Sudan using VAR specification. Future research could replicate our time-series specification to evaluate the impacts of

drastic oil shocks for other oil-dependent economies (or even subnational differences in oil effects, assuming that regional data coverage permits this type of analysis). Along these lines (and once data availability improves), one could also evaluate how the economy of South Sudan was impacted by oil following its own independence.

Appendix 1

Table A1. Variable definitions and summary statistics.

Variable	Definition	Mean (Standard deviation)
lpcgdp	Natural logarithm of GDP per capita values (real, 2010 base year)	7.122 (0.058)
Oil rent	Oil rents as a share of GDP	6.898 (1.437)
HHI	Herfindahl-Hirschman export diversification index. Range between 0 and 1, where higher values correspond to higher levels of export concentration	0.680 (0.030)
Rule of law	Rule of law index taking values between 0 and 16 (with higher values corresponding to superior performance). The variable captures a wide range of interrelated institutional qualities. It measures the independence of the judiciary, the extent to which rule of law prevails in civil and criminal matters, the existence of direct civil control over the police, the protection from political terror, unjustified imprisonment, exile and torture; absence of war and insurgencies, and the extent to which laws, policies and practices guarantee equal treatment of various segments of the population.	0.091 (0.010)

Appendix 2

Table A2. ADF Unit root tests (variables in levels)

Variable	ADF test statistic	1% Mackinnon Critical Value	5% Mackinnon Critical Value	P values	Remarks	Order of integration
$lpcgdp_t$	0.537	-3.572	-2.925	0.9860	non-station-ary	I(1)
$dHHI_t$	-0.765	-3.572	-2.925	0.8291	non-station-ary	I(1)
$oilrent_t$	-1.598	-3.572	-2.925	0.4846	non-station-ary	I(1)
$ruleoflaw_t$	-1.840	-3.572	-2.925	0.3607	non-station-ary	I(1)
Variable	ADF test statistic	1% Mackinnon Critical Value	5% Mackinnon Critical Value	P values	Remarks	Order of integration
$lpcgdp_t$	0.537	-3.572	-2.925	0.9860	non-station-ary	I(1)
$dHHI_t$	-0.765	-3.572	-2.925	0.8291	non-station-ary	I(1)
$oilrent_t$	-1.598	-3.572	-2.925	0.4846	non-station-ary	I(1)
$ruleoflaw_t$	-1.840	-3.572	-2.925	0.3607	non-station-ary	I(1)

Table A3. ADF Unit root tests (first differences)

Variable	ADF test statistic	1% Mackinnon Critical Value	5% Mackin-non Critical Value	P values	Remarks	Order of in-tegration
$dpcgdp_t$	-5.001	-3.573	-2.926	0.0000	stationary	I(0)
$dHHI_t$	-5.263	-3.573	-2.926	0.0000	stationary	I(0)
$doilrent_t$	-6.245	-3.573	-2.926	0.0000	stationary	I(0)
$druleoflaw_t$	-4.775	-3.573	-2.926	0.0001	stationary	I(0)

Appendix 3

Table A4. VAR lag order selection criteria

Lag	LL	LR	FPE	AIC	HQIC	SBIC
0	26.2468		0.000083	-0.877239	-0.834352	-0.765713*
1	42.5083	32.523*	0.000064*	-1.15126*	-0.979705*	-0.705151
2	50.721	16.425	0.000066	-1.12155	-0.821333	-0.340864
3	58.1156	14.789	0.00007	-1.06097	-0.63209	0.054294
4	60.1507	4.0702	0.000093	-0.798138	-0.240601	0.651699

Appendix 4

Table A5. Granger causality tests

Equation	Excluded	chi2	df	Prob > chi2
$doilrent_t$	$dHHI_t$	2.9912	1	0.084
$doilrent_t$	$dlpcgdp_t$	0.8903	1	0.345
$doilrent_t$	ALL	3.7995	2	0.150
$dHHI_t$	$doilrent_t$	6.0115	1	0.014
$dHHI_t$	$dlpcgdp_t$	2.2405	1	0.134
$dHHI_t$	ALL	7.6769	2	0.022
$dlpcgdp_t$	$doilrent_t$	1.5551	1	0.212
$dlpcgdp_t$	$dHHI_t$	0.12999	1	0.718
$dlpcgdp_t$	ALL	1.6212	2	0.445

Appendix 5

Table A6. Granger causality tests for full model with rule of law

Equation	Excluded	chi2	df	Prob > chi2
$dlpcgdp_t$	$doilrent_t$	1.5455	1	0.214
$dlpcgdp_t$	$dHHI_t$	0.1537	1	0.695
$dlpcgdp_t$	$druleoflaw_t$	0.9108	1	0.340
$dlpcgdp_t$	ALL	2.5584	3	0.465
$doilrent_t$	$dlpcgdp_t$	0.8292	1	0.363
$doilrent_t$	$dHHI_t$	2.9414	1	0.086
$doilrent_t$	$druleoflaw_t$	0.5011	1	0.479
$doilrent_t$	ALL	4.3347	3	0.228
$dHHI_t$	$dlpcgdp_t$	2.3668	1	0.124
$dHHI_t$	$doilrent_t$	6.0146	1	0.014
$dHHI_t$	$druleoflaw_t$	0.5194	1	0.471
$dHHI_t$	ALL	8.2676	3	0.041
$druleoflaw_t$	$dlpcgdp_t$			
$druleoflaw_t$	$doilrent_t$	0.00522	1	0.942
$druleoflaw_t$	$dHHI_t$	0.06963	1	0.792
$druleoflaw_t$	ALL	0.14462	1	0.704
		0.20074	3	0.977

Appendix 6

Table A7. Residual autocorrelation test

Lagrange-multiplier test

lag	chi2	df	Prob > chi2
1	14.029	9	0.121
2	8.708	9	0.465

Table A8. VAR stability test

Eigenvalue	Modulus
-0.567	0.567
0.316	0.31273
-0.067	0.066

Note: All the eigenvalues lie inside the unit circle. VAR satisfies stability condition.

Appendix 7

Table A9. VAR model results for GDP growth, HHI and oil rents (with post-2010 dummy)

Dependent variable	$dlpcgdp_t$ (1)	$dHHI_t$ (2)	$doilrent_t$ (3)
Constant	0.013	0.007	0.46
$dlpcgdp_{t-1}$	0.34** (0.13)	0.22* (0.12)	-6.10 (8.70)
$doilrent_{t-1}$	0.003 (0.002)	0.004** (0.002)	-0.32** (0.14)
$dHHI_{t-1}$	-0.04 (0.13)	-0.43*** (0.13)	12.46 (8.97)
post2010dummy	0.01 (0.021)	-0.041** (0.019)	-2.29 (1.35)
R^2	0.17	0.32	0.18
Number of observations	56	56	56

Note: Standard errors in parenthesis. *, **, *** correspond to 10, 5 and 1% level of significance

Appendix 8

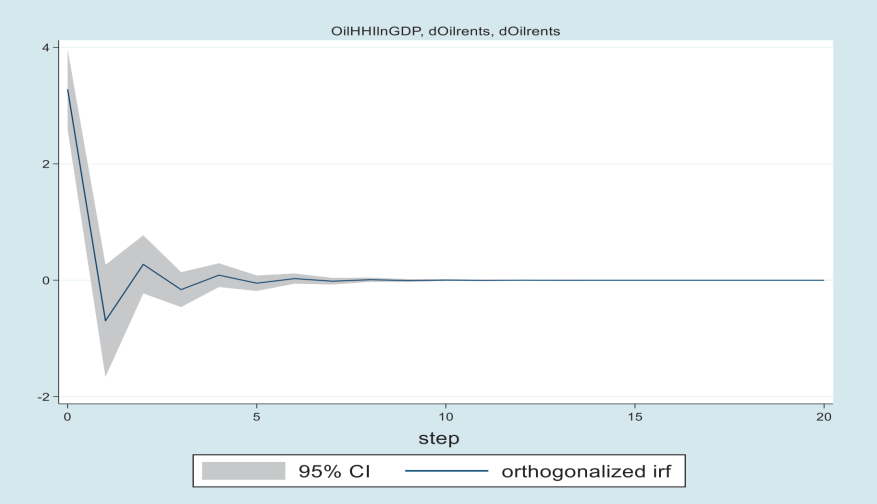


Figure A1. OIRF (oil impulse, oil response)

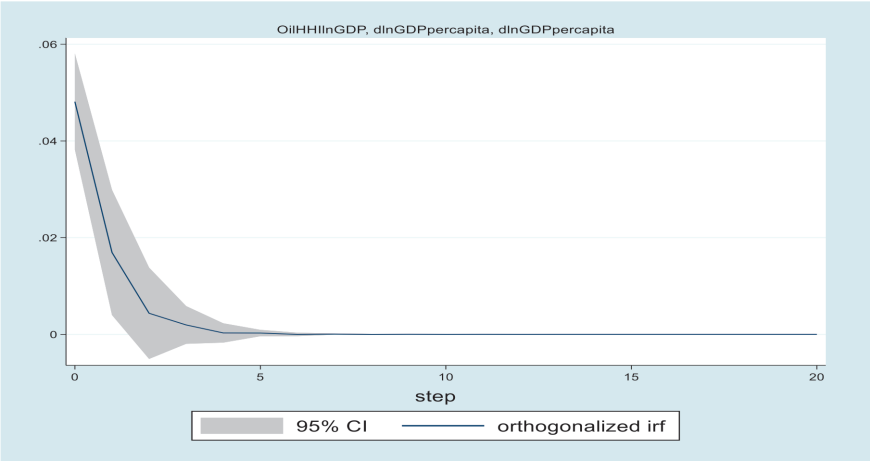


Figure A2. OIRF (growth impulse, growth response)

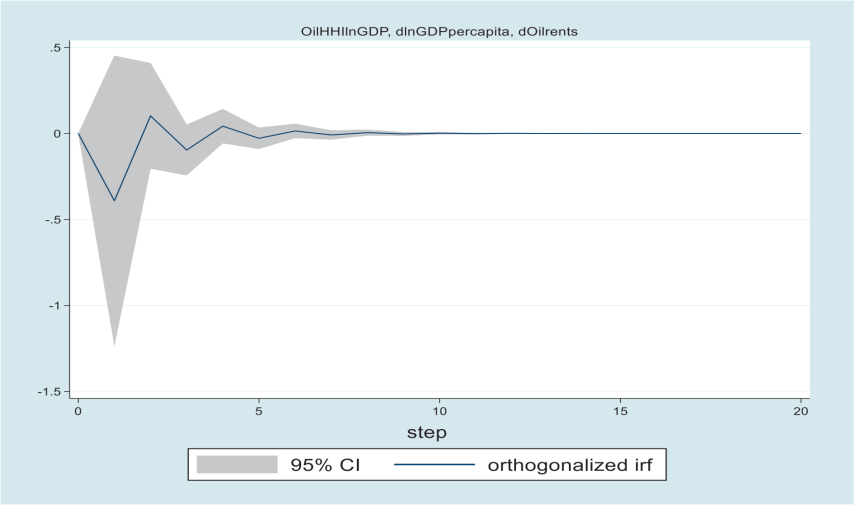


Figure A3. OIRF (growth impulse, oil response)

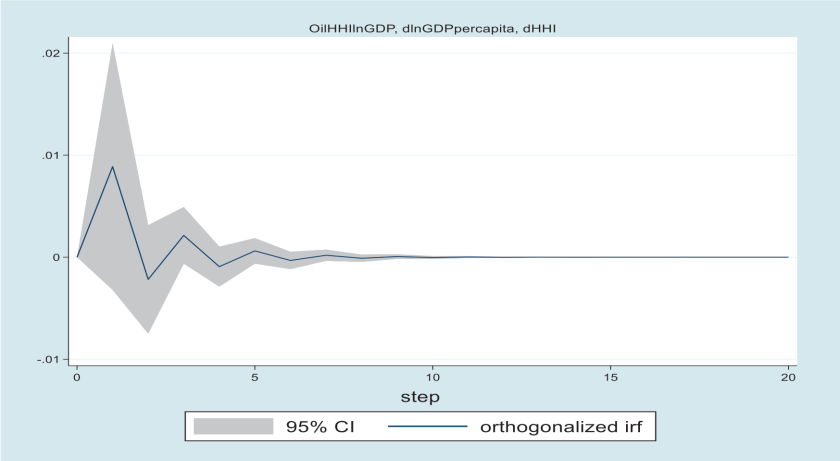


Figure A4. OIRF (growth impulse, HHI response)

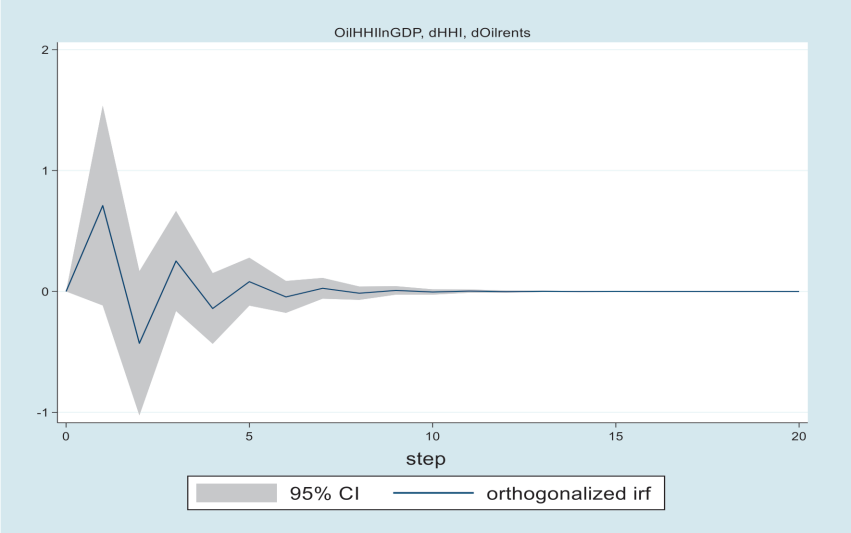


Figure A5. OIRF (HHI impulse, oil response)

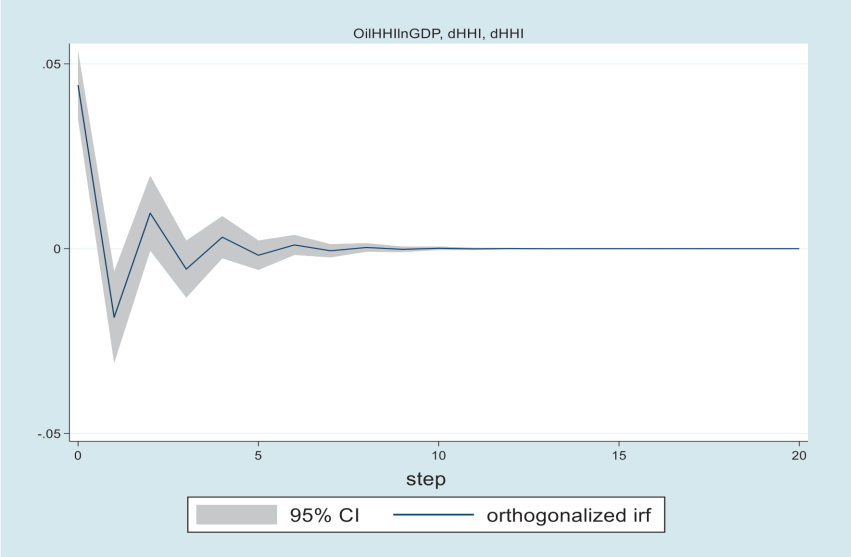


Figure A6. OIRF (HHI impulse, HHI response)

Appendix 9

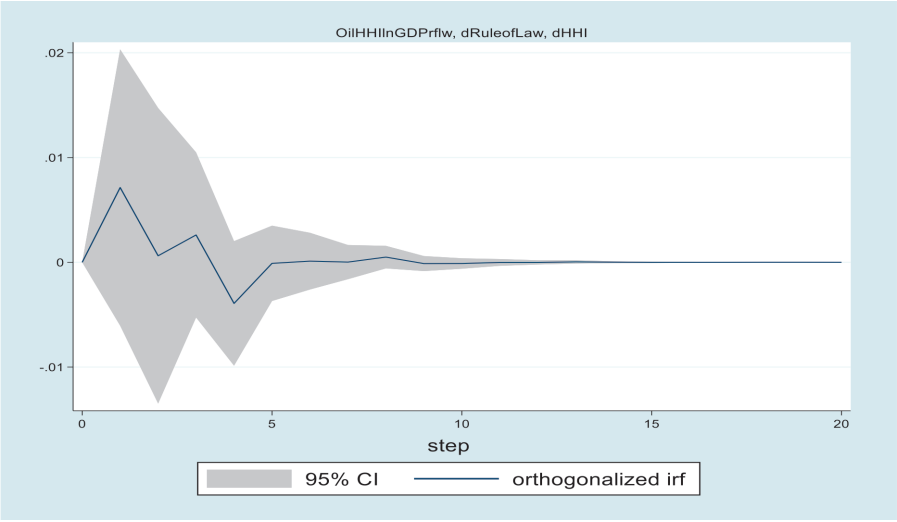


Figure A7. OIRF (rule of law impulse, HHI response)

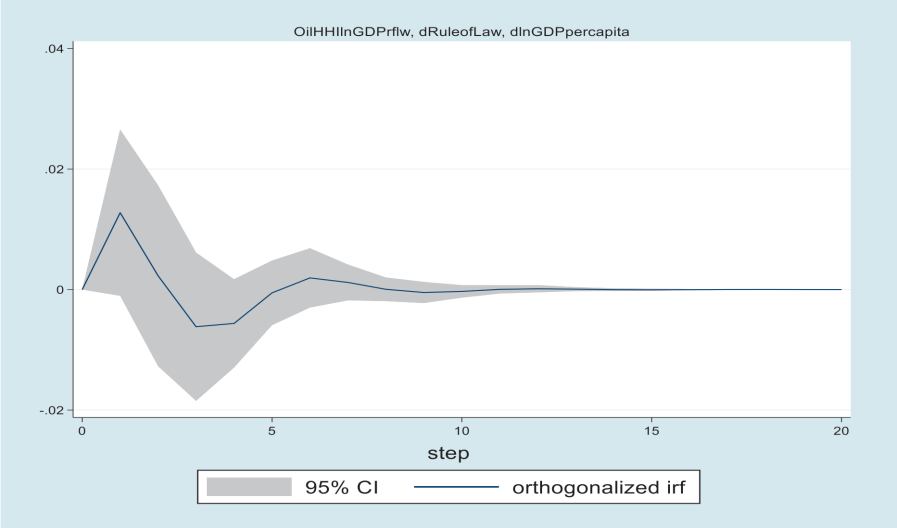


Figure A8. OIRF (rule of law impulse, growth response)

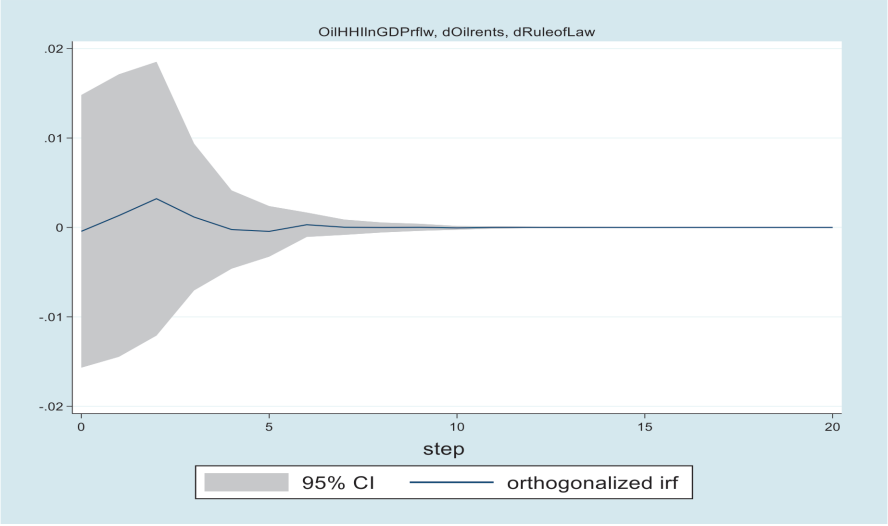


Figure A9. OIRF (oil impulse, rule of law response)

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CHAPTER 6 AN EVALUATION OF THE IMPACT OF OIL-RESERVE LOSS ON SUDAN'S GROWTH EXPORT DIVERSIFICATION, UNEMPLOYMENT AND CORRPUTION: A SYNTHETIC CONTROL METHOD

Abstract

Oil dependence can have critical economic and political effects on oil-rich states, especially in the case of ethnically polarized states. Moreover, Oil-dependence is associated with weak economic performance, export concentration, high unemployment rates and the spread of corruption. Many cross-country and country-specific studies provide evidences for oil, macroeconomic performance and corruption nexuses. Nonetheless, it is very rare for macroeconomist to experience the case of when a highly oil-dependent country faces a sudden loss of more than 70% of its proven oil reserves as a result of the separation of its oil-rich region. This, however, is the case of Sudan, which is the subject of this article. In this paper, we make use of the case-comparison approach called the Synthetic Control Method (SCM) to compare the performance of Sudan and synthetic Sudan in the post-oil loss period. Arguably, SCM outcomes are mixed and in general inconsistent with the resource cure predictions. Furthermore, except for the per capita growth and unemployment outcomes, all other placebo test outcomes show that the trajectories of Sudan and synthetic Sudan in the post-intervention period are statistically insignificant.

Keywords: Oil, Sudan, Export Diversification Synthetic Control Method, Natural resource Curse, Growth, Corruption

1. Introduction

The tendency of resource-rich countries to achieve less economic growth in comparison to resource-poor states has provoked the literature of the resource-curse, originally with the distinctive work of Auty (1993) and later Sachs and Warner (2001). Since then, many cross -ountry and country-specific studies have provided support to the expectations of the resource curse thesis (see Bleaney and Greenaway 2001; Hesse, 2008 and Acemoglu and Robinson, 2012). Moreover, a developing strand of resource curse literature has focused on the transmission mechanism of the curse (see Edwik, 2007; Murshed and Serino, 2011 and Papyrakis and Gilberthorpe, 2015). One of these transmission mechanisms gains its theoretical rationale from the export led theory. According to this transmission channel, natural resources, and particularly oil, diminish economic growth through their negative impact on export diversification. Other studies also link oil dependence to high unemployment rates. Oil promotes unemployment through the Dutch disease process. The increase in the oil rents Increases government spending on the non-tradable sector and hence crowds out the resources for the tradable ones. This leads

to premature de-industrialization and increases unemployment (see Abdel Fattah, 2017). Another strand of literature links oil dependence to the spread of corruption and weak institutions (see Murshed, 2004). Lack of transparency and absence of democracy normally associated with oil dependence open the door for rent-seeking and corrupt activities. Furthermore, week institutions allow bribery behaviors and boost corruption. The spread of corruption leads to the misallocation of resources and, hence, to the crowding out of local and foreign investment, which in turn hampers long-run economic growth and employment.

Oil was supporting economic growth in Sudan between 1999 and 2010. During these years, the economy was growing at an average of 6%. Nonetheless, this oil-led growth was associated with serious structural and macroeconomic challenges. One of these major challenges was high unemployment rates. Unemployment rates were equal to an average of 15% during the oil-dominance period (see Khlifa, 2016 and Soleman, 2007). This was mainly attributed to the crowding-out of agriculture and manufacturing and premature deindustrialization. Oil also hampered export diversification in Sudan. While oil exports were growing steadily to dominate Sudan's total exports, non-oil exports were invariably diminishing, and by the time of South Sudan's secession, oil represented 98% of Sudan's total exports. Similar to the majority of resource-rich developing countries, oil harmed the quality of institutions and promoted the spread of corruption in Sudan. Moreover, the institutional deterioration stimulated by oil prevented the economic transition from an oil-dependent economy to a more diversified and complex economy. In addition, rent-seeking behavior led to the spread of patronage and corruption among political elites and public officials. Corruption also created structural rigidities that spoiled the investment environment for both domestic and foreign investors.

This chapter will utilize a SCM to compare the evolution of selected macroeconomic and institutional quality indicators for both Sudan and synthetic Sudan in the post oil-loss period. The study will cover the period of 1995-2018 and aims to assess the assumption that the oil loss shock of 2011 promoted economic growth, export diversification and reduced unemployment and corruption. We apply a methodological approach of the Synthetic Control Method derived from Abadie and Gardeazabal (2003) and Abadie et Al. (2010). The SCM approach is divided into pre- (1995-2010) and post- (2011-2018) oil-loss periods. A set of pre-oil-loss period predictors are identified to determine the optimal weights that will minimize the prediction error between Sudan outcomes and the weighted average outcomes of synthetic Sudan in the pre-oil-loss period. Here, we try to create an analogy of Sudan's outcomes using a stable combination of the control countries. The synthetic Sudan then will represent a credible counterfactual that can be used to estimate the impact of the oil-rent loss on Sudan in the post-oil-loss periods. The calculated difference in changes between Sudan and synthetic Sudan in the post-oil loss period is the impact of oil rent loss on the export diversification. The statistical significance of this estimation is assessed using the placebo test approach. In the placebo test,

we reapply the SCM to the control countries in order to assess the probability value of the proportion of non-oil loss countries which have an estimated effect at least as large as Sudan's.

This chapter will utilize the SCM to compare the evolution of Sudan's HHI between two periods: the first is from 2004 to 2011, and the second is from 2011 to 2019. The study aims to assess the hypothesis that Sudan's export diversification measured by Herfindahl- Hirschman index has improved in the years following the loss of the proven oil reserve in 2011. We also investigate whether these changes in the HHI are really motivated by the reduction in oil abundancy after 2011. We apply a methodological approach of the Synthetic Control Method derived from Abadie and Gardeazabal (2003) and Abadie et al. (2010).

Section 2 will briefly discuss and review the empirical literature of the export diversification, oil and economic growth. Section 3 describes our strategy and data. Section 4 presents the results of the empirical investigation. With the exception of per capita growth and unemployment, the outcomes of synthetic control analysis are mixed and statistically insignificant. This means that the large oil shock of 2011 cannot justify the gap between Sudan and synthetic Sudan in the post-intervention period. Section two will briefly discuss and review the empirical literature of the export diversification, oil, and economic growth. Section three describes our strategy and data. Section 4 presents the results of the empirical investigation. Based on the outcomes of the SCM, we find that HHI decreased substantially after 2011. Finally, Section 5 concludes by summarizing the study main findings as well as proposing some policy recommendations for Sudan.

2. Literature Review

2.1 Resource Curse, Growth and Unemployment

The impact of resources on growth is still an area of great debate in the literature of the resource curse. The distinctive article by Sachs and warner (1995) established the theoretical base for the resource curse thesis. Since then, many studies have addressed the effect of resource dependence/abundance on growth using cross-country data as well as country-case studies. However, similar to the theoretical controversy, empirical studies outcomes were diverse. Despite this, the strand of literature supporting the negative links between resource dependence provides several transport mechanisms on how oil rents impede economic growth. This literature points to the Dutch disease, low levels of investment, lack of export diversification, and a lack of innovation as the main channels for the transmission of the resource curse. (See Atkinson and Hamilton, 2003; Marhubi, 2000; and Papyrakis and Gerlagh, 2004). Others argue that the low institutional quality promoted by rent-seeking behavior and endemic corruption is a major transmission mechanism for the negative impact of resources on growth (see Murshed and Torres 2011; Torvik, 2006). The resource cure thesis also covers the negative impact on resource abundance/dependence of on unemployment. However, similar to the growth

effect, the literature on oil and unemployment shows a mixed theoretical explanation as well as differential experimental results. The first part of this literature attributes the oil-employment links to the Dutch disease effect. According to this stream of literature, oil dependence promotes the non-tradable sector and hampers the tradable ones. As a result, this leads to a premature de-industrialization and increases unemployment (see Ouoba, 2016). In contrast, the second part of the oil-unemployment literature argues that resource rents increase investment in the resource sector, such as investment in the oil or gold sectors, and this simply reallocates part of the resources to these sectors. This increase of investment in the resource sector thus reduces unemployment (see Omojolaibi and Egwaikhide, 2014).

2.2 Resource Curse and Export Diversification

The curse of natural resources provides a theoretical explanation for the negative relationship between export diversification and growth in the context of resource-rich countries. Export concentration is identified as one the transmission mechanisms of the resource curse (see Gylfason and Zoega, 2002; and Papyrakis and Gerlagh, 2004). According to the resource curse thesis, oil dependence leads to a premature de-industrialization, and hence, it prevents the growth of non-oil exports and promotes oil exports. The end result of this process is a slowdown in economic growth in the long run (see Krugman, 1987 and Murshed, 2004). Some researchers indicate that the negative link between export concentration and growth in oil-rich countries passes through its poor institutions (see Dunning, 2005; Mehlum et al. 2006). This strand of the literature argues that the contest over oil rents by the elites hinders the investment and innovation needed to diversify exports (see Dunning, 2005 and Murphy, Shleifer and Vishny, 1993). Nonetheless, some studies provide empirical evidence that the failure of growth in resource-rich countries is their failure to diversify their economies and their export mix (see Murshed and Serino, 2011).

2.3 Resource Curse and Corruption

The resource curse thesis links oil dependence to the spread of corruption and poor institutions Shaxson (2007). Based on this literature, oil erodes institutional quality through rent-seeking, lack of accountability, and lack of transparency. Based on these studies, the institutional erosion in these economies manifests itself in the form of the spread of corruption, the lack of accountability, and the lack of transparency. This institutional degradation continues to manifest itself in the form of the further spread of corruption. According to this strand of the literature, corruption deteriorates economic governance and leads to the misallocation of economic resources. Moreover, the lack of transparency will reduce the ability of the economy to attract foreign direct investments. Some researchers also indicate that oil rents hampers democracy in oil- rich countries (see Bulte and Damania, 2008). However, it is important to note that some studies challenge the assumption that oil promotes poor institutions. They indicate that oil rents are not per se the reason behind the spread of corruption in oil-rich economies. Instead, they argue that it is

the quality of the institutions that prevailed before the introduction of oil rents that determines whether oil production will be a blessing or a curse (see Mehlum, Moene and Torvik, 2006; and Robinson, Torvik and Verdier, 2006).

Few studies have dealt with the impact of oil on the Sudanese economy, and their results have been mixed and have not provided a final conclusion about whether oil was a blessing or a curse. In her descriptive study, Nour (2011) shows that although oil did accelerate growth in Sudan, its production was also associated with a number of economic and development challenges. Her study discusses how oil affects the structure of the economy in a way that hamper sustainable and inclusive growth. She has also highlighted the growth of oil exports and the lack of export diversification as one of major outcomes of oil dependence. Furthermore, Khalifa (2016) finds that since 1999 the participation of non-oil exports, especially the agricultural ones, have dropped steadily. This in turn led to a sharp increase in the country's imports and resulted in a persisting deficit in the country's current accounts. Furthermore, Hassan and Abdullah (2014) empirically examine the impact of oil on the service sector in Sudan between 2000 and 2012. They show that there is a positive causal relationship from oil to services. Accordingly, they argued that oil promoted the growth of the non-tradable share in GDP between 2000 and 2012. Their study indicates that the emergence of the oil sector induces the growth in certain service sectors namely, construction, communication, hotels and hospitality, and transportation. In his research on how oil promotes corruption in selected African countries, Jerome et al. (2005) explain how the competition over rent capturing harms Sudan's institutions and promotes the spread of corruption. On another front, due the recent political development in Sudan and despite the lack of literature, oil rent is viewed as having strengthened the autocratic regime of Omer Al- Bashir. As is the case in many oil-rich countries, oil rents are claimed to have provided the regime in Khartoum with the revenues required to hinder any democratic transition during the last thirty years. Furthermore, oil rent reduction after 2011 could be assumed as one of the factors that accelerated the end of Omer Al-Bashir's reign in in 2019, and consequently promoted the democratic transition that is currently taking place in Sudan. The relationship between resource wealth (especially oil) and democracy has been the subject of many studies (see Murshed and Bergougui, 2020; Ross, 2001 and Dunning, 2008).

3. Synthetic Control Method, Data and Methodology

3.1 Synthetic Control Method

This paper employs the SCM to examine the impact of the loss of oil rent on export diversification in Sudan due to South Sudan's secession. This methodology has been selected because it gives the opportunity to create counter-factual regions that stimulate what the export diversification path of Sudan would have been if it had not lost oil rents. Moreover, the SCM does not require the same strict assumptions normally required for an accurate estimation of the difference-in-differences and

panel data analysis. The SCM also helps in avoiding the limitations in the time series as a tool to study the impact of policy shocks in both the mid- and long terms. In comparison to the time series method, SCM is less complicated. Furthermore, the selection of potential counterfactual or control units that match the affected unit can be problematic in time-series analysis and panel-data analysis. In contrast, the SCM allows the building of these control units using a weighted combination of a pool of potential donor units. Hence, the SCM employs a data driven approach in selecting comparable countries with a statistical affinity with Sudan. The method also avoids the problem of confounders associated with the variation in different approaches by weighting the control l group to better match the treatment group before intervention. The method uses a relatively long time series of the outcome prior to the intervention and estimates weights in such a way that the control group mirrors the treatment group as closely as possible.

According to the SCM model (Abadie andGardeazabal, 2003), the total evaluation period is represented by T. Assume also that J = {1……1+J} represents the set of affected and unaffected countries by intervention. Let j= 1 represent Sudan, whereas the rest, j=2,….,J+1, is a pool of donor-unaffected countries. Also assume that the T_0 reprensents the time periods before intervention. Also, for each country, j in time t, we observe (Y_{jt}) outcome of interest. For each unit, j and time period, t, we will define Y_{jt}^N to be the potential response without intervention. For Sudan, j=1, and a post intervention period,t >T_0 , we will define Y_{1t}^I to be the potential response under the intervention. Then the impact of oil rent loss on Sudan in period t

(With t >T_0) is:

$$\pi_{1t} = Y_{1t}^I - Y_{1t}^N$$

We also observe a set X_{1j},……$X_{\kappa j}$ of κ predictors of export diversification (Y), where X_1 represents the $\kappa \times 1$ vectors of predictors of export diversification of Sudan, and X_0a matrix $k \times j$ of export diversification in the donor countries and V is the $k \times k$ variable weighted matrix, indicating the significance of predictor variables (X) in determining export diversification (Y) .

The SCM is based on the assumption that a combination of units in the donor pool may approximate the characteristics of Sudan better than any unaffected one alone. The Synthetic control is defined as a weighted average of the units of the donor pool. formally the SC can be represented by a $J \times 1$ vector of weights, $W = (w_2$,……w_{J+1})' , where, $\sum_{j=2}^{j+1} w_j = 1$ and $w_j \geq \forall j \in \{2, \ldots . J+1\}$ so the synthetic Sudan is given by $Y_{jt}\, W$ given a set of weights, W the synthetic control estimators of Y_{1t}^N and π_{1t} are respectively

$\hat{Y}_{1t}^N = \sum_{j=2}^{J+1} w_j\, Y_{jt}$ And

$\hat{\pi}_{1t}$ =$Y_{1t} - \hat{Y}_{1t}^N$

So $\hat{\pi}_{1t} = Y_{1t} - \sum_{j=2}^{J+1} w_j Y_{1t}$

With the question of how the weight $w_2 \ldots w_{J+1}$, should be chosen in practice, Abadie and Grdeazabal (2003) and Abadie et al. (2010) propose to choose w_2 ,……, w_{J+1} so that the resulting synthetic control best resemble the pre intervention values for the treated unit of predictors of the outcome variable. That is given a set of non-negative constant,v_1,…….v_k, Abadie and Gardeazable (2003) and Abadie et al (2010) propose to choose the synthetic control $W^* = \left(W_2^*, \ldots\ldots, W_{J+1}^*\right)'$ that minimizes

$\|X_1 - X_0 \; W\| =$

Subject to the restriction that $w_2, \ldots\ldots, w_{J+1}$ are non-negative and sum to one. Then, the estimated treatment effect for the treated unit at time $t = T_0 + 1$,….. , T is

$\hat{\pi}_{1t} = Y_{1t} - \sum_{j=2}^{J+1} w_j^* \; Y_{jt}$

3.2 Synthetic Control Method of Inference

Inconsistent with the customary methods of statistical inference, Abadie et al. (2010) provide a method of inference for the Syntactic control analysis that depends on the pre-maturation distribution. According to this method, the shock treatment is repeatedly applied for all untreated units in the donor pool. This creates what is called the placebo effect each time. However, according to the SCM predictions, the largest intervention impact will be on the treated unit in comparison to the permutation distributions of untreated units. Accordingly, one can claim that the difference between the treated unit and the untreated ones in the post-treatment period is statistically significant. In practice, a test statistic is created to measure the ratio of the post-intervention fit of the synthetic control trajectory of the outcome variable to the pre-intervention fit. In other words, this statistic gives the permutation distribution, which is the ratio between the post intervention Root Mean Squared Prediction Error (RMSPE) and the pre-intervention RMSPE. The permutation distribution is then used to derive a p value from the proportion of untreated units, which have an estimated effect at least as large as that of the treated unit. This method is called the Non-Restricted Donor Sample method (NRDS).

However similar to any method, this method comes with its limitations. In the placebo test. The approximation of the treated and untreated in the pre-intervention period units is critical in evaluating the deviation between the two in the post-intervention period. Practically, if one or more untreated units in the donor pool do not closely fit the trajectory of the outcome variable for the treated unit before the intervention, this can result in over-conservative p-values (Papyrakis and Villar, 2017). Hence, Abadie (2010) came up with a second method of inference to mitigate this limitation. This method suggests applying the placebo test only on a restricted pool of the donor pool. This restricted pool should include only units or countries

that give the same pre-treatment RMSPE as Sudan. This method is called the Restricted Sample method (RS (n)), where n refers to the cut-off parameters.

Another limitation of this inference method is that it creates a trade-off between the need to improve the fit of the donor and the reduction of level of confidence that can be inferred. Therefore, a third method is suggested by Abadie et al. (2010) to tackle this limitation. This method simply adjusts the estimated effects measured in the treatment period against the pre-intervention deviation. Practically this method divides the post-intervention effect size estimate by the pre-intervention RMSPE. Analogously, in this method, the p- values are generated form the proportion of the treated units that have an estimated effect at least as large as the treated unit (Galiani and Quisorff, 2016; Papyrakis and Villar, 2017). Similar to the first method, p-values are derived from proportion of the untreated countries, which have an estimated effect of at least as large as that of the treated units (Sudan). This method is called the Adjusted Non-Restricted Donor Sample method (ANRDS).

3.3 Data and Methodology

Motivated by the growing popularity of SCM as a tool for quasi-experimental analysis, this paper employs the SCM to evaluate the impact of sudden oil-reserve loss on Sudan's oil-dependent economy. Furthermore, our analysis also reflects the (Abadie and Gardeazabal 2003) application of the same technique to evaluate the impact of the terrorism conflict on the Basque country of Spain's GDP. However, contrary to their case study, our case study indirectly investigates the impact of Sudan's north–south conflict on Sudan's GDP as the main reason of the secession of oil-rich South Sudan. Accordingly, our intervention shock is actually the loss of oil reserve back in 2011, whereas, in the case of the Basque country, the intervention shock is the onset of the terrorism conflict in 1975.

South Sudan seceded in 2011, and, by that time, oil represented more than 90 % of both the government's budget and the country's total export revenues[34]. Therefore, by creating a synthetic Sudan using a donor pool of unaffected countries, which provides a good resemblance to Sudan in the pre-oil loss period, we can assess the causal effect and the magnitude of the oil-loss shock in the post-oil period. This can be achieved by comparing the trajectory of selected macroeconomic variables for both Sudan and synthetic Sudan in the post-oil loss period. Accordingly, any observed divergence between Sudan and its counterfactual synthetic Sudan in the post-oil loss period could be attributed to the oil-loss shock of 2011. Moreover, more than ten years after the event, we still assume that a better understanding of this permanent shock is relevant and crucial to discerning the evolution of the Sudanese economy and drawing sound future policy recommendations. This notion gains more credence if we take into consideration that gold rents and exports have already replaced oil as the main source of foreign currencies and government revenues.

[34] Central Bank of Sudan annual report ,2010

Thus, Sudan is still adopting an economic model that could be classified as a natural resource-dependent economy rather than a diversified one.

In this paper, we use a comparative analysis to see what would be the performance of some key macroeconomic outcome variables for both the affected country (Sudan) and unaffected countries (donor-pool countries). These outcome variables include economic growth, unemployment, export diversification, and corruption. The selection of those variables is based on their well-established nexus with oil rents in the natural resource curse literature (see Sachs and Stiglitz, 2007). The SCM covers the period of 1995 -2018. The selection of this period reflects the time when oil rents began to have an increasing impact on the economy as well as maximizing the availability of data for all countries that are used to create synthetic Sudan. The pre-oil loss period includes the years 1995-2010, and the post-oil loss period covers the years from 2012 to 2018. Finally, the year of 2011 is identified as the intervention year, which is the date when Sudan lost more than 70% of its proven oil reserves.

3.3.1 Donor groups

For the sake of this analysis and in order to cover a wide spectrum of possible donor countries, we have applied the following approach for data collection and sorting. First, we have merged three datasets: the World Bank World Development Indicators (WDIs), World Governance Indicators, the democracy dataset (V-dem 2019) and the UNCTAD dataset of export concentration index and Balance of Trade. Second, in selecting the door countries, we have excluded all countries that experienced changes in its borders between 1995 amd2019, such as Serbia, Kosovo, Timor-Leste, and Montenegro. This is to make sure that only Sudan will be affected by the intervention or the shock. Moreover, donor countries must meet certain conditions. The first condition is that they must have been consistently oil-rich throughout the analysis period. This is again to make sure that Sudan will be the only country that has experienced a sudden cut off of its oil production and rent during the analysis period. The second condition is that donor countries must have an average oil rent as a percentage of GDP that is equal to or greater than 10%. Additionally, their fuel exports as a percentage of total exports, must be equal to or greater than 30%. These two thresholds have been determined to reflect the donor countries high dependency on oil, which make them a good counterfactual group for the affected unit (Sudan). Following this approach, we have created two donor groups from the same dataset. The first group consists of countries with an average oil rent that is =/> 10%, whereas the second group consists of those countries whose fuel exports are =/> 30% for the entire period of the analysis. As a result, the first donor group includes 25 countries, and the second donor group includes 27 countries. A list of the two donor groups is provided in Appendix 1

3.3.2 Outcome variables

As discussed in the previous sections in this paper, the SCM is utilized to assess the effect of the sudden oil loss on three outcome variables. The first outcome variable

is the export diversification, and to investigate the effect on this variable, we make use of the export product concentration index of the UNCTAD as a measurement of export diversification. The index takes the values between 0 and 1 (countries with an index closer to 1 have a highly concentrated export basket, and those with an index closer to 0 have quite diversified series of export products). The second targeted outcome is economic growth measured by the per-capita growth rate. The third dependent variable of interest is unemployment measured as a percentage of the total workforce. Both the growth and unemployment data are taken form the World Development Indicators (WDIs) of the World Bank. The last outcome variable covered by the scope of study is corruption.

In this study, three different indexes are used to evaluate corruption. The first corruption measure is the political corruption, of which this indicator measures the prevalence of political corruption. The index takes interval values between 0 and 1 with higher values corresponding to higher level of political corruption and vice versa. The second corruption index is the Executive corruption. It measures whether and how routinely do members of the executive or their agents grant favours in exchange for bribes, kickbacks, or other material inducements, and how often they steal, embezzle, or misappropriate public funds or other state resources for personal or family use. This index takes the interval level of values from 0-1. Values that are closer to 0 indicates lower levels of executive corruption, and higher scores reflect higher levels of executive corruption. The third measure of corruption is the regime corruption index. It measures the corruption acts which are carried out by political officers. This index has also an interval level from low to high (0-1). These three indices measure corruption on three different scales. The political corruption index reflects the general prevalence of corruption among Sudan's political elites. Furthermore, the regime corruption index and the executive corruption index refer to corruption at the highest and lowest public administrative positions, respectively. The data for the three corruption indicators come from the Democracy Dataset V-dem _v9).

3.3.3 Predictor variables

This study makes use of a large number of predictor variables for the different outcome variables. However, For the sake of consistency, we have used the same predictors for all the outcome variables. These predictor variables comply with a vast literature on the determinants of the outcome variables in oil-dependent economies. These predictors Include, population, foreign direct investment, other institutional variables, inflation etc. The list of these predictors is provided in Appendix 1. Similar to other SCMs, we have also used the lagged values of the outcome variables as predictor variables in order to control for the unobservable characteristic and to ensure that any post-oil loss diversions observed between the synthetic and actual Sudan can be attributed to the intervention.

4. Findings and Discussion

4.1 General Findings in Both Groups

As mentioned in the previous section, the synthetic control analysis has been conducted with two groups of donor countries to capture the impact of oil loss on predictor variables using both fuel exports and oil rent as a measure of oil dependence. For each predictor variable, we will discuss the impact using the oil rent graphical outcomes and provide the graphical results for the fuel export group in the appendixes. Moreover, the estimated weights per donor country and outcome variables are provided in Appendix (2). Furthermore, the fit of the donor countries could be evaluated using the graphical outcomes of the differences between Sudan and synthetic Sudan in the post-oil-loss period. Subsequently, we conduct the placebo test to assess the statistical significance for the gap for each post-oil-loss year based on the ANRDS inference method. In general, the analysis of the two groups provides similar outcomes in terms of the performance of each predictor variable in the post-oil-loss period. Moreover, with the exception of per capita growth and unemployment (in the oil rent group) none of the outcome variables provide a statistically significant P- value for the differences between Sudan and synthetic Sudan in the post-intervention period. The results for other outcome variables do not support the assumption that the difference between Sudan and synthetic Sudan is attributed to the oil shock of 2011. In the next section, we will discuss in detail the SCM results for each outcome variable and the insights they provide about the impact of oil-loss on Sudan's economy in the post-oil-loss period.

4.1.1 Effect on per capita growth and unemployment

According to the resource curse predictions, oil has a negative impact on both unemployment and growth in the long run. The resource curse thesis attributes the underperformance of oil-rich economies to the Dutch disease and deindustrialization, lack of innovation, and weak institutions (see Papyrakis and Gerlagh, 2004). However, despite oil leading the growth in Sudan between 2000 and 2010, the oil-led growth in Sudan was associated with high unemployment rates. The left-hand sides of Figs. 1 and 2 display the trajectory of these two variables in the post-intervention period and show the adjusted P-Values for differences in the performance of the two variables for real Sudan and synthetic Sudan. Fig.1 shows large variability in per capita growth between Sudan and synthetic Sudan in the post-intervention period; the size of the gap is equal to 4%. Nonetheless, this gap diverged sharply after 2012, and the two lines show a pattern of convergence between 2013 and 2015. But Sudan seems to outperform synthetic Sudan in 2016 and 2017. However, since 2018 Sudan's per capita growth declines sharply in comparison to synthetic Sudan. Moreover, the adjusted P-values in the right-hand side of Fig.1 indicate that the pattern of the interaction between the two lines is statistically significant at a 10% level in 2012, 2016, 2017 and 2018. Hence, the interaction

between the per capita growth of Sudan and syntactic Sudan could be attributed to the oil-loss shock in 2011.

These outcomes support the fact that oil was the leading growth factor in Sudan in the pre- intervention period. However, the oil-led growth was neither inclusive nor sustainable. Through the Dutch disease transmission mechanism, oil dependence creates structural rigidities which manifest themselves into the deterioration of growth in the post-intervention period. Furthermore, oil crowded out agriculture and manufacturing and hence harmed the diversity of the economy, making it very vulnerable to changes on oil prices and production. As a result, after the oil loss in 2011, there were no equal substitutes for oil. High oil-dependency was also associated with a continuous decrease of exports and an increase of imports because of the appreciation of the Sudanese currency. Moreover, the increase of inflation created instability that also harmed agriculture and manufacturing, thereby reducing the revenue from the non-oil exports. On the other hand, the non-tradable service sector grew substantially during the oil era. Hence, between 2001 and 2018, the per capita growth declined at an increasing rate. The increase in per capita GDP in 2012 was attributed to the increase in the agriculture growth rates, which increased by 5.7[35]in 2012 due to the good rain (UNDP Sudan, 2013). It was also partially related to the short-term impact of government three-year program (2012-2014) for macroeconomic stabilization. However, this improvement did not last for long as the growth rates started to decline sharply from 2013. The manufacturing sector also contracted due to the impact of the Dutch disease, and this contributed to the reduction of growth in the post-oil-loss period. The industrial sector as a whole dropped by an estimated 6.8 percent in 2012 owing to the significant drop in the oil sub-sector. Furthermore, since the growth of the service sector was led by oil, the sector decelerated at a rate of 3% starting form 2012. This also contributed to the reduction of growth in the post-intervention period. The deceleration of the service sector was the result of the slowdown in activities related to the oil sub-sector. Finally, 2018 witnessed a sharp decline in per capita growth amid the economic crisis that triggered public uprising and eventually ended Omer Al-Bashir's 29-year reign in 2019.

Fig.2 shows the evolution of unemployment in the post-oil period for both Sudan and synthetic Sudan. The figure displays a huge divergence between Sudan and synthetic Sudan in the post-intervention period. The graph depicts a gap size of 14% between real Sudan and synthetic Sudan in the post-oil loss period. Moreover, the P-value graph also indicates that this divergence is statistically significant in almost all the post-intervention years. This means that the differences in unemployment paths between Sudan and synthetic Sudan could be attributed to the oil loss shock in 2011. Contrary to predictions of the resource curse, unemployment increased from an average of 15% in the pre-intervention period to an average of 18% in the

[35] Final Macroeconomic Update 2011-2013. UNDP Sudan,2013

post-oil-loss period. These outcomes could be well understood by analysing how oil structurally affects unemployment in both supply and demand sides. As we mentioned earlier in this paper, oil was associated with high unemployment rates in Sudan. On the supply side, oil created disparities in services between rural and urban areas in Sudan. However, the agricultural sector dominated as the main job provider sector in the rural areas with more than 45% of the workforce employed in this sector. As a result, the majority of the young workforce who migrated from villages to cities were shifting their jobs from the agricultural sector to the service sector, and this shift increased during the oil era. As a result, after the oil-loss the lack of jobs in the oil-led growing service sector left the majority of migrated labours without jobs and, furthermore, to the deterioration in education in terms of volume and in terms of skills. Oil crowded out manufacturing and hence reduced the need for skilled labour. During the oil-dominating period, 62% of higher education students were involved in the humanities in comparison to only 32% of them in the sciences (African Economic Outlook, 2012). Over time, this created a mismatch between the outcomes of the education system and the employers in the technically sophisticated manufacturing sector.

On the demand side, the high rate of unemployment could be attributed to the impact of the Dutch disease, which caused the decay of the non-oil sector, especially of agriculture that is responsible for more than 45% of employment in Sudan. Additionally, the reduction in agricultural exports made it less competitive and less attractive, especially for young farmers. Therefore, the absence of new jobs in the oil sector in the post-oil loss era, together with the failure of the agricultural sector in creating jobs, amplified unemployment in the post-intervention period. Also, the growth of the service sector at the price of agriculture and manufacturing had an inflationary effect. Moreover, after the loss of oil, the decline in economic growth, and the devaluation of the currency due to the loss of oil export revenues, inflation rates continued to shoot up at very high rates and reached the level of 35.6% in 2012. This eventually led to a stagflation situation as the economy entered a situation of inflationary recession. As a result, the economy's ability to attract foreign direct investment deteriorated dramatically, and most local companies moved out of Sudan, causing the loss of a large number of jobs, especially in the services sector. In addition, lower government spending due to lost oil revenues increased job losses due to lower government development spending. The results of the impact of oil-loss shock on unemployment and per capita growth in the group of fuel export show no distinct difference from the oil-rent groups. However, differences between the trajectories of unemployment and growth for treated and untreated units are not statistically significant in the post intervention period. Results for unemployment and growth in the fuel export group are available in Appendix 3.

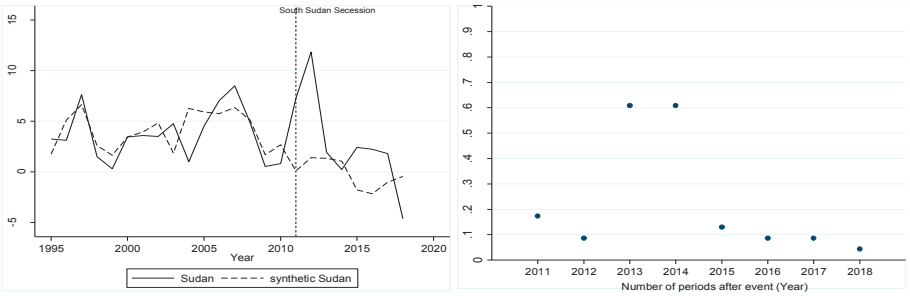


Figure 1 Per capita growth and adjusted P-Values

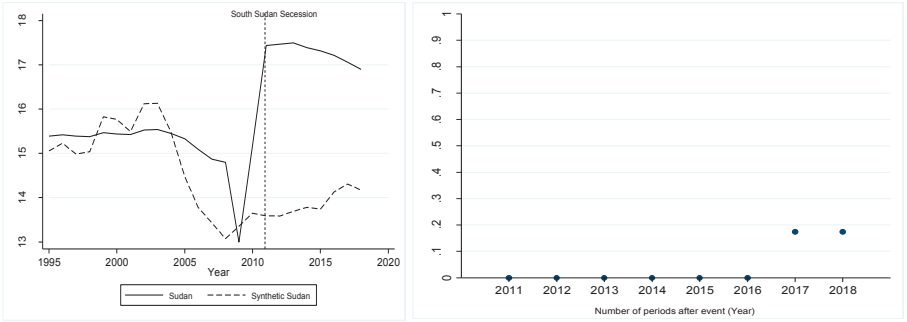


Figure 2 Unemployment rates and adjusted P-Values

4.1.2 Effect on Export concentration

The impact of oil loss shock on the export structure of the Sudanese economy is one of the subjects of this synthetic control analysis. Fig. 3 below compares the evolution of the export concentration index for Sudan and synthetic Sudan. The left-hand side of the figure indicates that export concentration index values are smaller for Sudan compared to synthetic Sudan in the post-intervention period. The size of the gap between the two lines is equal to an average of -0.2. However, the P-Values displayed in the left-hand graph indicate that this gap is not statistically significant. This means that the reduction in Sudan's exports concentration index in the post-oil-loss period cannot be attributed to the oil shock of 2011. Nonetheless, oil participated in the increase of export concentration through the Dutch disease process; oil crowded out agriculture and manufacture. As a result, non-oil revenues continuously deteriorated while oil exports were increasing steadily (Nour, 2011). Also, the appreciation of Sudanese currency triggered by oil revenues prevented the growth of Sudan's exports and instead increased imports. As a result, the non-tradable commodities grew substantially between 2000 and 2010. Furthermore, oil harmed the structure of the economy. The service sector, especially which related

to oil sector, was growing at the expense of the historically dominated agricultural sector. As a result, agricultural exports declined substantially and hence reduced the share of non-oil exports between 2000 and 2010. However, after the secession of South Sudan, the agricultural sector returned to take its part in the economy and its participation in the export mix also increased. Also, the growth of the gold sector added to the export mix. This has been reflected in a slight improvement in Sudan's export basket and in the scores of the export concentration, although still high relative to countries with a more diversified export basket. Similar to previous outcome variables, results of the oil shock impact on export concentration for Fuel export group shows no significant difference. The graphical illustration of these results is available in Appendix 4.

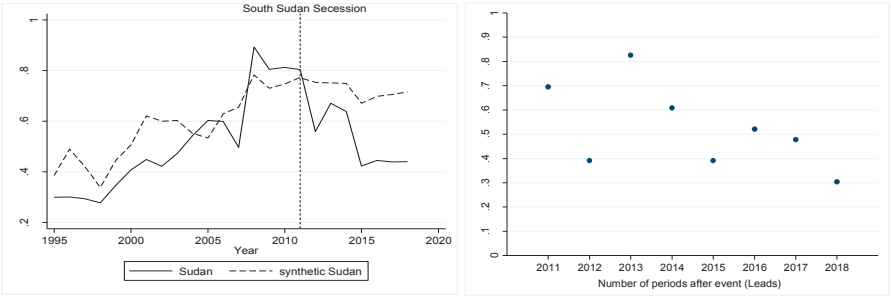


Figure 3. Export concentration index and adjusted -Values

4.1 .3 Effect on Corruption

The spread of corruption and the resulting institutional malfunctioning is one of the transmission mechanisms of the natural resource curse (see Murshed, 2004). Hence, in addressing the performance of the Sudanese economy after the oil-loss shock in 2011; we apply the SCM to evaluate the difference in trajectories of the number of corruption measures between real Sudan and synthetic Sudan. The basic assumption is that oil-loss should be associated with an improvement in corruption scores and better institutional quality in Sudan. The left-hand side of Fig. 4, 5, and 6 provide a graphical illustration of the path of political corruption, executive corruption, and the regime corruption indexes in the post-intervention period for real Sudan and synthetic Sudan. The right-hand side of figs 4, 5, and 6 display the statistical significance of the gaps between Sudan and synthetic Sudan obtained from the placebo test results.

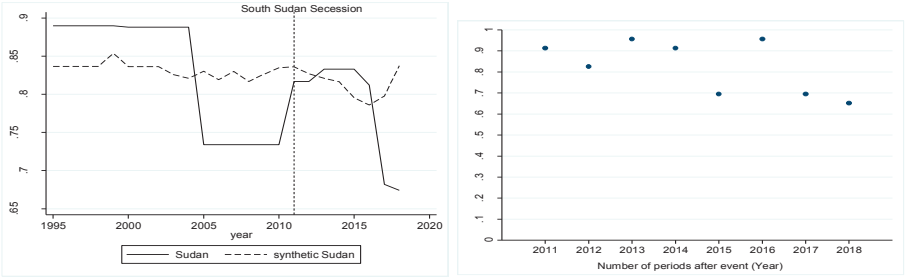


Figure 4. Regime corruption index and adjusted P-Values

In general, Figs. 4 to 6 show limited variability between Sudan and synthetic Sudan, especially for executive corruption and regime corruption indexes in the two years that follow 2011. The gap between the two lines do not exceed 0.05. Furthermore, between 2013 and 2017, the two lines (of Sudan and synthetic Sudan) for the executive corruption index converged, and starting from 2018, Sudan seems to perform better in the executive corruption index in comparison to the synthetic Sudan. In contrast, real Sudan seems to perform worse in comparison to synthetic Sudan in the regime corruption index between 2013 and 2017. However, after 2017 Sudan's scores of regime corruption index declines sharply in comparison to synthetic Sudan. Nonetheless, the P-values displayed in the right-hand side of each graph show that the trajectories of both executive and regime corruption indexes are not statistically significant at any significance level. This means that the evolution of these indexes for both Sudan and synthetic Sudan cannot be attributed to the oil-loss shock in 2011.

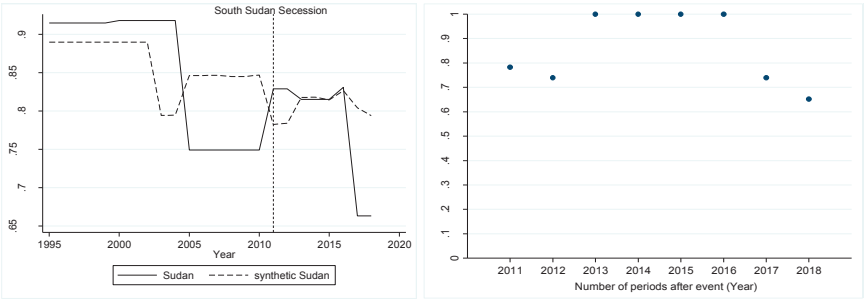


Figure 5. Executive corruption and adjusted P-Values

Regarding the measure of corruption acts among the higher and lower administrative officials, Sudan has had higher rates of regime and executive corruption. However, although statistically insignificant, these results are in line with the resource curse expectations. Hence, looking at the performance of these

measures pre- and post-oil shocks, we are able to state that oil cannot be blamed for the high corruption levels among these higher and lower public officials. Other studies have provided explanation for the high level of corruption at these administrative levels. Elnafabi (2010) attributed the spread of corruption among the higher and the lower public officials to the weak and ineffective internal control systems, deficiencies in the accounting systems, non-deterrent penalties, very low salary levels, and the backlog of external auditing and nepotism. Therefore, the financial corruption among higher and lower officials has been deeply rooted and institutionalized in Sudan. The political corruption index shows a slightly different pattern in the post-oil loss period in comparison to the previous two indexes. According to fig.6, we can see that Sudan scores higher levels of political corruption between 2011 and 2017 compared to synthetic Sudan. The two lines diverged which created an average gap of 0.05 scores. However, after 2017, Sudan's political corruption score collapsed sharply in comparison to synthetic Sudan. Nonetheless, the P-Values in the right-hand side of the figure indicate that this gap between the treated and untreated units is not statistically significant. Ultimately, this gap cannot be attributed to the oil shock in 2011.

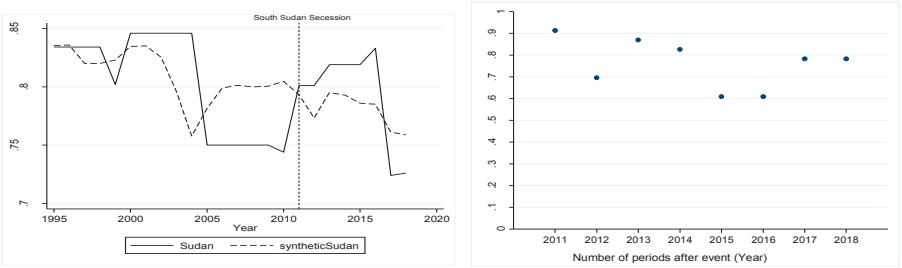


Figure 6. Political corruption index and adjusted P-Value

This result contradicts the natural resource predictions that lower oil dependence should be associated with less corruption levels. In general, the figure shows that Sudan used to have high political corruption scores that were on average up to 0.8 even before 2011. Furthermore, the outcome of the insignificant P-values generated by the placebo test supported the assumption that political corruption is deeply rooted in Sudan and does not arise from dependence on oil. Moreover, as a measure of the use of political power for personal and family interests, political corruption has been attributed to the prolonged absence of democratic governance in Sudan. This is mainly due to the successive dictatorships that have dominated the system of government in Sudan since its independence. Ismail (2011) attributed the spread of political corruption in Sudan to the lack of accountability and transparency, inefficiency, the concentration of power in the hands of a few people, and the low

quality of education. Moreover, the historical dependence of the Sudanese economy on only one commodity or a very limited number of commodities as the main source of government and export revenues makes the economy a rent-based economy. These commodities are cotton, crops seeds, oil, and recently gold, and through the rent seeking process it helps in centralizing the power in the hands of only a few groups of people or elites. As a result, political corruption became more aggravated over time in Sudan. Hence, despite the loss of oil rent, the gold rent will continue as a potential source of rent seeking and political corruption motivator. The outcomes of the synthetic control analysis on corruption and the oil-loss shock for the fuel export group are the same, and the graphical depiction of these results are provided in Appendix 5.

5. Conclusion and Policy Recommendations

Oil has dominated the Sudanese economy for more than 15 years. During these years, it has caused significant structural changes that are still affecting the economy even ten years after the secession of the oil-rich South Sudan in 2011. Therefore, the analysis and understanding of the impact of oil on major macroeconomic variables during the oil-dominance period is crucial to address the evolution of the economy in the post-oil era. Inspired by its popularity in comparative studies, the synthetic control methods, provide a strong analytical tool to compare the evolution of key macroeconomic variables that are assumed to be the most affected by oil. These variables are economic growth, unemployment, export concentration, and corruption. Moreover, the literature of the resource curse provides sufficient evidence for the nexus between the macro indexes and oil dependence in oil-rich countries. Our study contributes to both the literature of the resource curse by discussing the unique case of Sudan as an oil-dependent country which has witnessed a sudden loss of more than 70% of its oil revenues. It also contributes to the empirical literature of comparative studies by applying the SCM to compare the evolution of selected macro-economic variables in the post-oil shock.

Our study applies the SCM to address the evolution of per capita growth, unemployment, export concentration, and corruption in the post oil-loss period. We have assessed the trajectory of these variables for Sudan and synthetic Sudan using two groups of donor countries depending on their fuel export levels and oil rent levels. In general, the outcomes are mixed and do not provide strong evidence to attribute the gaps in the performance of these variables between Sudan and synthetic Sudan to the oil shock of 2011. However, it reveals important facts about these variables in the context of Sudan's economy. Our analysis shows that only per capita growth and unemployment have significant adjusted P- values in the post-oil-loss period. Nonetheless, this applies only to the oil-rent donor group. However, the impact on both growth and unemployment contradicts the predictions of the resource curse thesis, since, on the whole, Sudan has witnessed a decline in the per capita growth and a substantial increase in unemployment. This opens the door for more studies to either support the result that we obtained or provide an opposite

narrative. In our study, we conclude that oil was leading the growth in Sudan and that the major part of the growth was in the service sector particularly that linked to oil. At the same time and through the Dutch disease channel, oil did crowd out other sectors, especially agriculture that had been responsible of more than 40% of job creation, especially in rural areas. Hence, the diminishing of oil revenues has led to a sharp decline of growth due to the absence of an equivalent substitute to oil revenues. This, over time, has increased the unemployment rate in the post-oil loss period.

Contrary to the growth and unemployment, the results for export concentration are consistent with the predictions of the resources curse. Although insignificant in all post-oil-loss years, Sudan shows a slight improvement in its export concentration index in the post-intervention period in comparison to synthetic Sudan. This is mainly attributed to the gradual improvement in the agricultural sector and the increase of its participation in the export mix as well as the introduction of other sectors, particularly gold. Nonetheless, Sudan still has a highly concentrated export basket, and this is partially related to the negative impact of oil on exports. The appreciation of the Sudanese currency increased imports and hampered exports for many years. As a result, the non-tradable sector grew steadily at the expense of the tradable one, and this inhibited the growth of the non-oil exports.

The outcomes for corruption are mixed and generally insignificant. Both regime and executive corruption show a small reduction after the oil-loss shock in 2011. However, the results of the placebo test provide evidence that the evolution of these two indexes cannot be attributed to the oil-loss shock in 2011. Thus, although consistent with the prediction of the resource curse, the decline in oil rents cannot be introduced as the reason behind the modest improvement in both regime and executive corruption in Sudan. These results also support the argument of many researches who claim that corruption among lower and high executives in Sudan did not originate with the oil-based economy (see Elnafabi, 2010 and Ismail, 2011). The political corruption index provides some different outcomes. Furthermore, although statistically insignificant in all year in the post-oil period, the SCM results shows that political corruption increased in the post-intervention period in Sudan compared to synthetic Sudan. Moreover, the gap between real Sudan and synthetic Sudan in the post-intervention period cannot be linked to the oil-rent-loss shock of 2011. Similar to the performance of the executive and regime corruption, these results suggest that political corruption as a measure of broad corruption in Sudan was also deeply rooted even before the exploitation of oil in 1999. Our study suggests that the long-lasting dependence on only one commodity or a basket of a few goods (cotton, crops, oil, and recently gold) as the source of government revenues together with the prolonged period of authoritarian rule, exacerbated the rent-seeking behavior and promoted the spread of corruption over time.

Based on these results, this study comes to the conclusion that in order for Sudan to have sustainable growth linked to a high level of job creation, it must adopt a more diversified export basket. The agricultural sector is a good place to start as it generates more than 40% of jobs among the young workforce. However, the fact that 70% of the agricultural sector is traditional and relies heavily on the amount of rainfall makes it a risky substitute as a sustainable source of growth and jobs. Efforts should be accelerated to modernize this sector and integrate it into the manufacturing sector. Moreover, the manufacturing sector is lagging behind despite its importance for sustainable growth. To promote the major improvements in this sector, the main challenge is to create the required infrastructure. This chiefly includes transportation and energy sources. Some policy changes are also needed to support industrialization in Sudan, especially those related to the labor market, monopolies, and the investment climate, and especially for small and emerging companies. Finally, corruption has become a major issue in Sudan and impedes sustainable growth and development in various aspects. The conclusion generated by this study, that corruption in Sudan is not of oil origin, reveals the fact that corruption is deeply rooted and requires specifically designed policies to eliminate it. Our study suggests that Sudan should urgently try to join the Extractive Industries Transparency Initiative (EITI) as several studies have demonstrated the positive relationship between this initiative and economic growth (see Papyrakis, Pellegrini and Lopez-Cazar, 2020). In addition, Sudan is currently going through a transitional period to achieve a full democratic transition by 2024. The sustainability of the democratic system represents a major step towards impeding and preventing political corruption in Sudan in the future (see Murshed and Bergougui, 2020).

This study opens the door for further discussion and investigation into the impact of natural resource rents on growth, unemployment, export diversification, and corruption in Sudan. Future research may include iterating SCM to address the impact on other selected macroeconomic variables. Other research directions can also assess the evolution of variables that has been covered by this study, but over a longer span of time. The SCM can also be implemented to investigate the impact of other oil-related shocks on Sudan's GDP, such as the date of oil discovery and the date of oil revenues loss. However, these kinds of assessments are limited by the lack of data especially for South Sudan in the pre-intervention period.

Appendix 1.

Table 1 Outcome and Predictor variables used in the synthetic control analysis

Outcome Variable	**Variable Description**	**Data Source**
Per capita Growth	GDP per capita is gross domestic product divided by mid-year population. Data are in constant 2010 U.S. dollars.	World Bank (2019)
Unemployment	Refers to the share of the labor force that is without work but available for and seeking employment.	World Bank (2019)
Export Concentration	Shows to what extent exports of an economy is concentrated on few products rather than among several products.	UNCTAD (2019)
Executive Corruption	Measures the prevalence of political corruption.	V-Dem (2019)
Regime Corruption	Measures whether and how routinely members of the executive, or their agents grant favours in exchange for bribes, kickbacks, or other material inducements.	V-Dem (2019)
Political Corruption	Measures the corruption acts which are carried out by political officers.	V-Dem (2019)
Predictor Variable	**Variable Description**	**Data Source**
Oil Rent	Oil rents are the difference between the value of crude oil production at world prices and total costs of production.	World Bank (2019)
Fuel export (% of merchandise imports)	Fuels comprise the commodities in SITC section 3 (mineral fuels, lubricants and related materials).	World Bank (2019)
Log of Population	Total population is based on the de facto definition of population, which counts all residents regardless of legal status or citizenship.	World Bank (2019)
Foreign direct investment	Foreign direct investment are the net inflows of investment to acquire a lasting management.	World Bank (2019)
Trade share of GDP	Trade is the sum of exports and imports of goods and services measured as a share of gross domestic production.	World Bank (2019)
Military expenditure	Military expenditures data from SIPRI are derived from the NATO definition.	World Bank (2019)
Education expenditure	General government expenditure on education (current, capital, and transfers) is expressed as a percentage of total general government expenditure on all sectors	World Bank (2019)
GDP growth	Annual percentage growth rate of GDP per capita based on constant local currency. Aggregates are based on constant 2010 U.S. dollars.	World Bank (2019)

Control of corruption	Control of corruption captures perceptions of the extent to which public power is exercised for private gain, including both petty and grand forms of corruption, as well as "capture" of the state by elites and private interests.	World Bank (2019)
Regulatory quality	Perceptions of the ability of the government to formulate and implement sound policies and regulations that permit and promote private sector development.	World Bank (2019)
Rule of law	Rule of Law captures perceptions of the extent to which agents have confidence in and abide by the rules of society, and in particular the quality of contract enforcement, property rights, the police, and the courts, as well as the likelihood of crime and violence.	World Bank (2019)

Appendix 2.

See table 2

Table 2 List of donor pool countries and weights by outcome variable

Outcome variable	**Per capita growth**	**Unemployment**	**Export Concentration**	**Executive corruption**	**Regime corruption**	**Political Corruption**
Donor Pool	Weight	Weight	Weight	Weight	Weight	Weight
Algeria	0	.043	0	0	.455	0
Angola	.142	0	0	0	0	0
Azerbaijan	.03	0	.754	.087	0	0
Congo Rep.	0	0	0	0	0	0
Ecuador	0	0	0	0	0	0
Egypt	.308	0	0	.165	0	.048
Equatorial Guinea	.035	0	0	.04	.25	0
Gabon	0	0	0	0	0	0
Iran Rep.	.051	.021	0	0	0	0
Iraq	0	0	0	.341	.049	.443
Kazakhstan	0	0	0	.245	0	0
Kuwait	0	0	0	0	0	0
Libya	0	.575	0	.122	0	.351
Nigeria	.238	.171	0	0	.245	0
Oman	0	0	0	0	0	0
Qatar	0	0	0	0	0	0
Russia Federation	0	0	.207	0	0	0
Saudi Arabia	0	0	0	0	0	.049
Trinidad and Tobago	0	0	0	0	0	.001
Turkmenistan	.043	0	.038	0	0	0
United Arab Emirates	0	0	0	0	0	.021
Venezuela	.077	.191	0	0	0	.087
Yemen Re.	.077	0	0	0	0	0

Appendix 3.

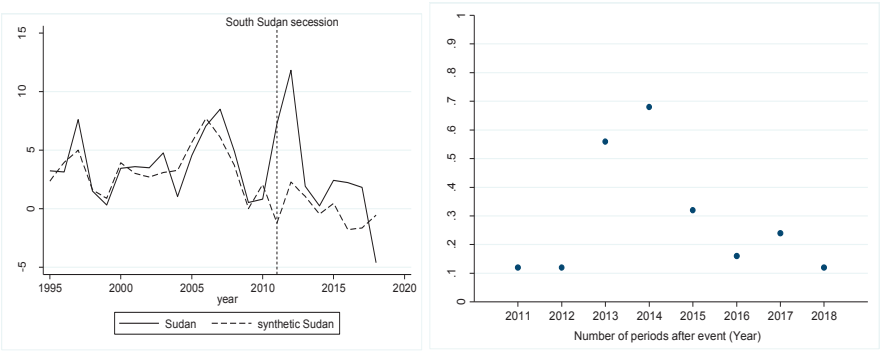


Figure 7. Per capita growth and adjusted P-Values (Fuel exports group)

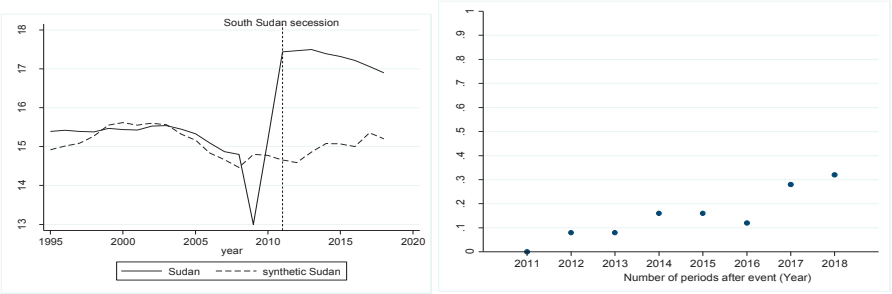


Figure 8. Unemployment rate and adjusted P-Values (Fuel export group)

Appendix 4.

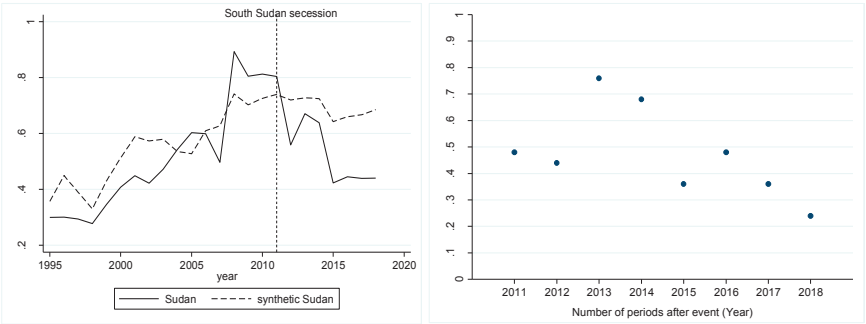
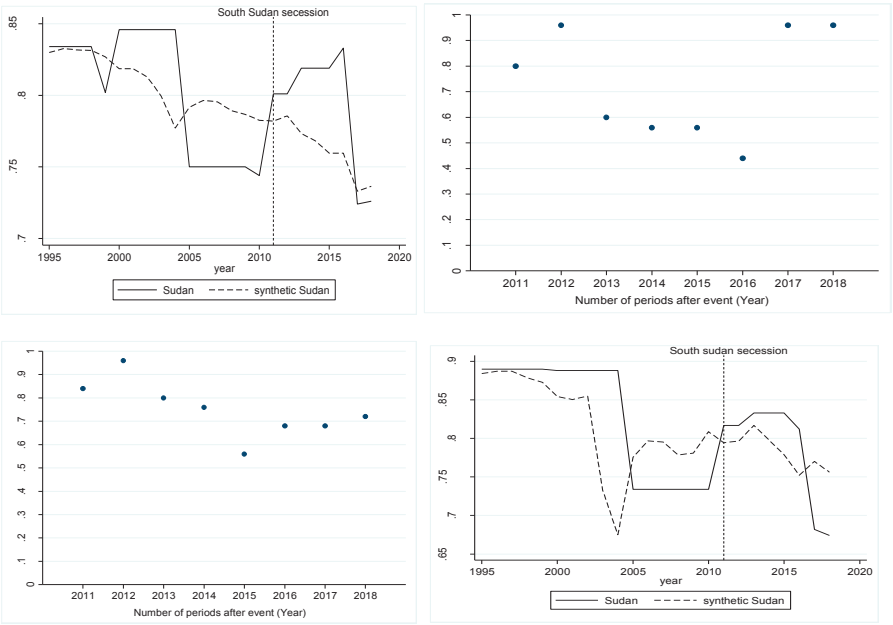


Figure 9. Export concentration index and adjusted P-Values (Fuel export group)

Appendix 5.



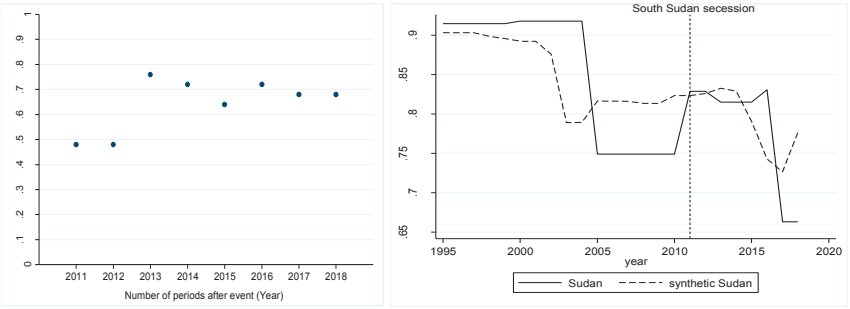


Figure 10. Corruption indexes and adjusted P-Values (Fuel export group)

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CHAPTER 7 CONCLUSION, POLICY RECOMMENDATIONS, CONTRIBUTION, AND SUGESSIONS FOR FUTURE RESEARCH

1. Introduction

In this chapter, we intend to summarize the main findings of these various articles. On the theoretical level, the first article discusses the relationship between the natural resource abundance/dependence and happiness. The other three chapters deal with the unique case of Sudan as an oil-dependent country that has witnessed a sudden halt in the flow of oil revenues due to the secession of its oil-rich region (South Sudan) in 2011. These chapters focus on the impact on economic growth, export diversification, and the institutions quality. In addition to stating the outcomes of these studies, we have also drawn up key policy recommendations as well as suggesting potential areas of research in the future.

2. Conclusion and Policy Recommendations

2.1 Conclusion

This research, attempts to contribute to the ongoing discussion of the thesis of the resource curse. On a theoretical level, we bring together, and as far as we know (for the first time) two sets of literature in order to come up with a new perspective of the resource curse. The literature of the natural resources and growth in one hand and the literature of the subjective well-being and growth on the other hand. Based on the findings of panel data analysis, and consistent with the thesis of the resource curse, we find that citizens of resource-rich countries tend to be less happy than their counterparts in resource-poor countries. Our analysis provides empirical evidence for the negative relationship between oil rents and level of happiness over time. Furthermore, this happiness 'resource curse' curse appears to be oil-specific and holds both for the levels of happiness as well as for the changes in happiness. The significance of these finding is that they provide a new perspective to explain the popular phenomenon the resource curse. Therefore, the resource curse can not only explained in terms of a reduction of economic growth but also in terms of a reduction of happiness. These findings can be justified by the fact that many studies provide evidences for the negative nexus between oil dependence and number of happiness determinates such as unemployment, per capita income corruption, and environment.

The other three chapters focuses on the unique case of Sudan. As we have mentioned before Sudan represents a unique case because the country suddenly lost its oil revenues due to the secession of oil-rich reign (South Sudan). However, during the period of oil exploitation Sudan was highly oil- deponent. By the secession of South Sudan 70% of these revenues transfers to South Sudan. Chapter 4 uses recent descriptive data from both countries to address the impact of oil retransfer on both

economies. The chapter introduces a comparison between the evolution of both economies in terms of macroeconomic indicators export diversification /concentration and institutions in the post-South Sudan secession period (2011-2019). According to the prediction of the resource curse it is expected that northern Sudan economy should perform better in these indicators due to the reduction on oil dependency in comparison to South Sudan's (which is expected to develop resource curse symptoms as oil-dependence increases). Based on the outcomes of the discussion in this chapter, Sudan shows a pattern of improvements in these three areas. Oil loss has created incentives for export diversification, sound macroeconomic policy, as well as institutional improvements in Sudan. On the other hand, the data on South Sudan's economy reflects a premature oil dependence that has led to export concentration, institutional degradation, and macroeconomic instability. Accordingly, Sudan has a greater likelihood of achieving export diversification, macroeconomic stability, and institutional promotion than South Sudan in the post-South Sudan Secession period. The slight improvement in Sudan's institutions reflects the role of oil in eroding country's institutions and intensifying corruption. As oil production was increasing Sudan's corruption indexes, especially the executive corruption index, the rule of law, and the political corruption indexes were increasing steadily between 2000 and 2010. However, right after the secession of South Sudan and the subsequent reduction in oil rents these three indexes show a slight improvement between 2012 and 2018. These findings is consistent with the predictions of the resource curse.

Nonetheless, despite the fact that the finding of the previous chapter supports the notion and the predictions of the resource curse in the case of Sudan and South Sudan, the outcomes of the empirical chapters do not provide evidence that Sudan has experienced a resource curse during the period of oil exploitation. More precisely, although the patterns of the data are consistent with the predictions of the resources curse they are not enough to claim a significant negative causal relationship between dependence and growth, export diversification, unemployment and institutions. Moreover, in an attempt to probe into these possible causal relationships, chapter 5 makes use of time series analysis to trace the impact of on export diversification and growth in the short and long term. However, the results of this chapter do not provide support to the existence of a resource cure in Sudan. The findings show that while oil shocks influence export diversification in the short term, it is not the extractive sector that is to blame for the unsuccessful attempts to diversify the export structure in the long run. Hence, it is the role of the policy makers to build a long-term strategy to create a more diversified economy in the future. These findings also show that limited export diversification and malfunctioned institutions appear to be a chronic problem of the Sudanese economy rather than phenomena that is influenced by the degree of oil dependence.

In the same vain, Chapter six examines the significance of oil dependence to Sudanese economy by empirically addressing the impact of oil rent loss on Sudan's

economic growth unemployment export diversification and institutional quality in the post oil loss period (2011-2019). In this chapter we make use of the comparative analysis approach called Synthetic Control Method (SCM) to compare the performance of Sudan and synthetic Sudan in the post-oil-loss period. consistent with chapter 5 findings and although the descriptive analysis in chapter 4 shows that the patterns of Sudan's major economic and institutional indicators show some improvements after the loss of oil; the synthetic analysis outcomes do not provide support to causal relationship between these indicators and oil rents loss in 2011. The results shows that except for the per capita growth and unemployment, all other placebo test outcomes show that the trajectories of Sudan and synthetic Sudan in the post-intervention period are statistically insignificant. Hence, all changes that Sudan witnessed in terms of levels of unemployment and corruption cannot be attributed to the oil-loss shock of 2011. These results are mixed and in generally do not provide an evidence that Sudan has witnessed a resource cures during the period of oil exploitation. Hence together with the previous results it shows that although oil cannot be blamed for the deterioration of growth and institutions during the oil exploitation period, the loss of oil rents also cannot explain the trajectories of these indicators in the post-oil era.

Given the above discussion it could be argued that Sudan's weak economic performance, lack of export diversification and institutional degradation are structural problems and are not oil triggered problems. Furthermore, although the descriptive data during the period of 2000 and 2019 reflect some popular symptoms of a resource curse, findings from empirical investigations provide no evidence for causal relationships between oil dependence and these indicators, especially regarding institutions and economic growth. Accordingly, the claim that Sudan has witnessed the natural resource curse after the exploitation of oil back in 1999 lacks empirical support. The findings challenge the resource curse by showing that the impact of oil dependence is insignificant and that lack of export diversification, economic instability and institutional malfunctioning are structural problems that precede the introduction of the booming sector (which is the case of Sudan).

2.2 Policy Recommendations

Findings of this thesis entails important policy implications that should be considered by policy makers in resource-rich countries and in particular in oil-rich ones. Results from chapter 3 show that governments in resource-rich economies should not only measure the impact of oil by its negative impact on GDP growth but also its impact on the quality of citizens' lives. This makes the increase of government's oil rents as important as how equitable the distribution of these rents are. It also gives more importance to the degree of transparency of the government about the amount of oil revenues and the spending channels and priorities. These results also highlight the importance of allocating a considerable amount of oil revenues to spend on education, health care, job creation and institutional

improvement to improve citizen's happiness in oil rich countries. Moreover, It emphasises that extractive industries should be aware of the importance of equal distribution of resource rent among local communities as well as keeping the negative impacts particularly the environmental one at the minimum. Accordingly one can advocate that measuring happiness would make a better policy target for the governments in resource rich countries than GDP. This would stress the necessity of improving the data reliability of happiness measures in the future (ideally across multiple dimensions of human well-being) and creating adjusted GDP values that incorporate elements of well-being typically ignored in national accounts (e.g. environmental and social externalities, informal production, inequality in income, and access to resources, etc.)

In light with the conclusion that we have drawn based on the finding from chapters 4, 5, and 6 that have examined the case of Sudan an important policy recommendations could be suggested. For both Sudan and South Sudan economies macroeconomic instability, export concentration and poor institutional quality seem to be structural and not oil driven. Hence governments in both countries should implement serious economic and institution reforms to tackle these challenges and allow these economics to translate their natural endowments in to a blessing. These policies should prevent high and volatile inflation and exchange rates. They should also reduce trade balance and budget deficits. Adopting these policies can play an important role in reducing inflation rates and hence allow more domestic savings and boost investment. Regarding exchange rate fluctuations, it is important to remove the multiple exchange rates. This can be achieved by unifying the official and black-market rates. Moreover, policies that can encourage can encourage the flow of foreign direct investment are crucial for export diversification, especially foreign direct investment that can enhance technological capabilities. This is important because Sudan needs to diversify its economy to compensate for loss of oil rents. Similarly, South Sudan needs to adopt a more diversified export mix to hedge against external oil prices and demand shocks.

However, for both economies, agriculture and livestock are the best potential sectors to achieve export diversification. This because first both countries have huge agricultural and livestock potentials that provides jobs to more than 70% of both countries labor forces. Second agriculture is a defuse resource that has strong forward and back ward linkages and hence can represents and good base for sustainable growth and development. And third because both economies currently lack the infrastructure and human capital required support the emergence and sustainability of manufacture. Both countries also lack matured financial institutions that can avail financial resources for manufacture as well as very weak ability to attract forging direct investment. Hence agriculture and agricultural-based manufacture can represents a good starting point. Nonetheless, the agricultural sector Nonetheless, this sector is facing serious challenges in both countries, namely, low productivity and policy distortions. As well as institutional degradation and

bureaucracies. To improve the productivity of agriculture and livestock, both countries have to invest in expanding agricultural infrastructure, increase the use of fertilizers, and increase the private sector participation in the agricultural investment. Furthermore, both countries also need to implement policy reforms to improve the performance of the agricultural sector. These policy reforms should focus on land ownership and production relationship policies as well as improving the future management of livestock. Huge reforms are also required to improve the institutional quality in both countries. Transparency and anti-corruption policies are also of great importance to improve the investment environment and attract FDI.

Furthermore, the outcomes of these chapters show that the institutional degradation is not oil driven and is rather a structural problem that characterised the economy even before the introduction of the booming sector. The findings provides empirical support to a previous study by Elnafabi (2010) which shows that the spread of corruption among the higher and the lower public officials to the weak and ineffective internal control systems, deficiencies in the accounting systems, non-deterrent penalties, very low salary levels, and the backlog of external auditing and nepotism. Therefore, the financial corruption among higher and lower officials has been deeply rooted and institutionalized in Sudan. Moreover, the fact that Sudan is till primary product economy as agriculture and gold currently dominates country's export mix; the adoption of anti-corruption policies is of paramount importance to the Sudanese economy to ensure the establishment of pro-growth and pro-economic diversification institutions in the future.

3. Thesis Contribution

The thesis contributes to the literature of the resource curse on both the theoretical and the empirical levels. First, this study provides a new perspective on the so-called happiness resource curse. Consequently, the resource curse can not only be detectable in the diminishing rate of growth over time, but also in terms of declining levels of happiness. To our knowledge, this is the first study to combine the literature on resource abundance with growth on the one hand, and growth and subjective well-being on the other hand. Moreover, the remaining chapters contribute to the empirical literature of the resource curse by addressing the unique case of Sudan as an oil-dependent country that experienced a sudden decline in its oil revenues. One of these chapters discusses the development of the economies of Sudan and South Sudan in terms of economic growth and diversification of exports and institutions in the post-secession era. The second article deals with the impact of the sudden reduction of oil reserves on the diversification, growth, and corruption of Sudan's exports using the VAR model. The results of this study contribute to the discussion of whether or not Sudan has suffered from the oil curse. It is also the first to empirically examine the existence of the political oil curse in Sudan. The last article is the first to apply the comparative approach of the synthetic control method to compare the performance of real Sudan to synthetic Sudan, assuming that south

Sudan did not separate. The study compares Sudan and synthetic Sudan in terms of per capita growth export diversification and corruption.

This contribution has important policy recommendations. It highlights the importance of incorporating the resource impact on the subjective well-being when formulating the policies that ensure the maximization of oil rents benefits. The study also has important policy considerations for Sudan. It highlights the fact that oil cannot be blamed for weak institutions and spread of corruption. This emphasizes the importance of the adoption of anticorruption policies to ensure pro-growth and functioning institutions. Furthermore, although oil intensifies export concentration, this study shows that this problem is structural and is not of oil origin. Hence, the adoption of policies that encourage and support export diversification are crucial to ensure structural change in Sudan's export mix.

4. Suggested Areas for Future Research

The discussion on the resource curse is far from conclusive. Building on this, the outcomes of this study open the way for further contributions to this discussion as well as highlighting new areas of research. First, although this study is the first to explore the fascinating relationship between oil rents and happiness several limitations still remain. Future empirical work could attempt to unravel mechanisms through which natural resources can affect happiness levels and changes. In addition, our happiness index is simply an average and, hence, does not reveal any information about the distribution and inequality of perceived well-being levels within each country's population. Case studies and more disaggregated econometric models should complement the more aggregate country-specific analysis by examining the localised effects of oil presence (e.g. as in the case of environmental externalities or employment creation). Moreover, the scale used to measure happiness might be perceived differently within different cultural contexts, and, therefore, subnational studies may be more appropriate for comparison purposes. Furthermore, the sub-periods of our analysis have a relatively short time span (of 4 years). In future studies, a longer time series will allow research to uncover relationships that are less likely to be influenced by short-term fluctuations (in happiness and other explanatory variables).

Second, the outcomes of the studies addressing the case of Sudan have been mixed and, as such, challenge the predications of the resource curse in different ways: in particular, the relationship between oil and institutions. Indeed, this relationship represents a key area for further investigation in the future. In general, further studies on the evolution of the economies of both Sudan and South Sudan are required. Additionally, future studies should revisit the impact on institutions as well investigate the impact on other macroeconomic variables that have not be covered by this study, such as inflation and exchange rates for both Sudan and South Sudan. Furthermore, as we suggest in Chapter 3, future research could replicate our time-

series specification to evaluate the impacts of drastic oil shocks on other oil-dependent economies (or even sub-national differences in oil effects, assuming that regional data coverage permits this type of analysis). Along these lines (and once data availability improves), how the economy of South Sudan was impacted by oil following its own independence could also be evaluated. Finally, in Chapter 4, we recommend that future research may include iterating SCM to address the impact on other selected macroeconomic variables. Other research directions can also assess the evolution of variables that have been covered by this study, but over a longer span of time.

BIOGRAPHY

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Bio: Sabna is doctoral researcher at the International Institute of Social Studies (ISS) of Erasmus University Rotterdam in The Hague. Sabna is researching the macroeconomic links between oil and several economic and broader development outcomes. She has an in-depth knowledge of macroeconomic policy and analysis, especially in relation to the Sudanese economy and the specific challenges of developing and oil-rich economies. She received her BSc in economics from the University of Khartoum in Sudan; and her MSc from the University of Dundee in the United Kingdom. Sabna is also a Lecturer of Economics at the University of Khartoum. For more than ten years Sabna has been teaching different economic courses for the undergraduate students. These courses includes intermediate microeconomics, macroeconomics and policies, economic developments, mathematical economics, environmental economics and energy economics and policies. She has also supervised the graduate research of undergraduate students. In addition to her primary job functions Sabna is committed researcher. Sabna is actively conducting research in areas of macroeconomic policies, extractive industries and their impact on economic development as well as the environment economics and climate change impact on economic growth. Additionally, working with quantitative techniques and large datasets is one of her key strengths. Sabna is critical and efficient when analysing data, paying particular attention to identifying inconsistencies and interpreting results. She has built strong expertise in econometric/statistical analysis and has applied a wide range of methods (panel data techniques, VAR time-series modelling, synthetic control experimental methods etc). Sabna has also worked as an economic consultant for the ministry of energy and petroleum in Sudan. She provided consultancy on the energy and petroleum economics and policies.

PUBLICATIONS AND CONFRENCE PARERS

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