Good Fuels and Bad Metals in a Growth Story of Transition Economies

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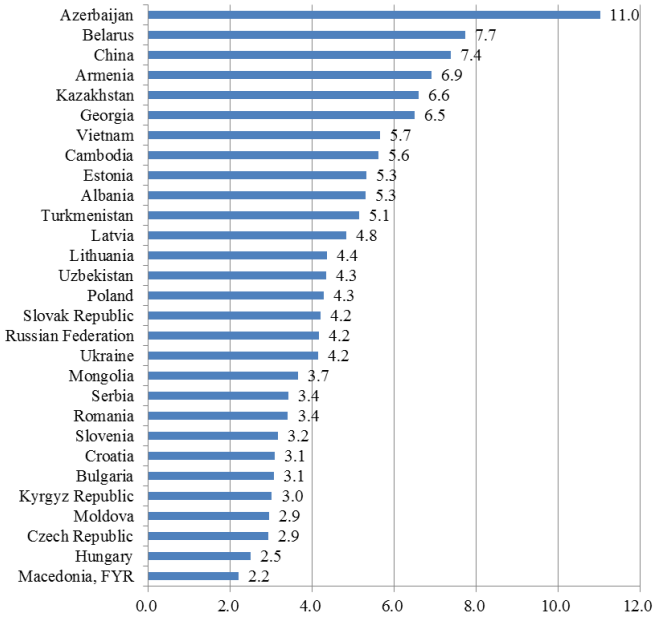
***Abstract*—Whether natural resource abundance benefits or harms the growth has been long a debated issue. The case of transition economies presents an interesting case as major economic transformations can be observed in a relatively short span of time. Following the initial setbacks in the 1990s, natural resource export served as the main source of income in many transition economies. The available cross-country data on natural resource exports includes naturally existing resources like fuels and metals, as well as human-produced resources like agricultural raw materials and food. This paper focuses on fuel and metal resources and finds that their relationship with economic growth is not the same. Cross-sectional empirical analysis of 24 transition countries along with other countries between 1996 and 2010 indicates that despite the fear of resource curse, transition economies indeed benefited from natural resource exports, especially from fuel exports. The negative association of metal exports with economic growth estimated in cross-section regressions can be explained with country specific effects that can be controlled through fixed effects model.**

***Index Terms*—Economic growth, natural resources, fuel exports, metal exports.**

I. Introduction

According to World Bank countries moving from centrally planned to market oriented economies are countries with transition economies [1]. These countries include China, Mongolia, Vietnam, former republics of Soviet Union, and the countries of Central and Eastern Europe. Transition in China and Vietnam took more gradual character taking a span over three decades. Other transition countries opted for a shortcut and followed so-called "shock therapy" recommended by International Monetary Foundation (IMF). Majority of these countries have suffered hyperinflation, poverty, unemployment and government budget collapses. The interest in natural resources and economic development has extended to the transition economies as several transition economies such as the Russian federation, Kazakhstan, Azerbaijan, Turkmenistan, Uzbekistan, and Mongolia are natural resource exporting countries and some of them enjoyed high growth rates (Fig. 1, Fig. 2). For most transition economies the data on major economic indicators became available from 1996 as previously they have followed socialist accounting system. On average, between 1996 and 2010, the transition economies grew by 4.7% almost twice higher than the rest of the other countries combined.

The economic performance within transition economies varies significantly and there are countries dependent on resources exports mainly within Commonwealth of Independent States (CIS) as well as industrially developed states within Central and Southeastern Europe and the Baltics (CSB). During transition period resource-rich countries increasingly relied on their resource exports and have displayed seemingly higher growth rates. Therefore, this raises the question whether natural resources helped these countries to overcome the economic recession in 1990s defying the "curse" and "disease" warnings.



Data source: Penn World Tables 7.1 Calculations by author

Fig. 1. Average real per capita GDP growth rates in transition economies, 1996-2010.

The main variable used in literature to express the natural resources is primary export share in Gross National Income (GNI) available from World Bank database. This variable indeed comprises four types of exports: 1) fuels corresponding to SITC Rev.3 category 3; 2) ores and minerals, hereafter written as metals, corresponding to SITC Rev. 3 categories 27, 28, and 68; 3) food corresponding to SITC Rev. 3 categories 0, 1, 22 and 4; and 4) agricultural raw materials corresponding to SITC Rev.3 category 2. This research focuses on naturally existing resources such as fuels and metals, as food and agricultural raw materials are produced more as a result of human production activities.

Furthermore, countries with high fuel export shares such as Azerbaijan, Kazakhstan and Belarus seemingly performed better than metal exporting countries such as Mongolia, Bulgaria and Armenia (Fig. 1, Fig. 2).

Manuscript received August 21, 2014; revised July 27, 2015. This work was financially supported by Ministry of Education, Culture, Sports, Science and Technology (MEXT) of Japan.

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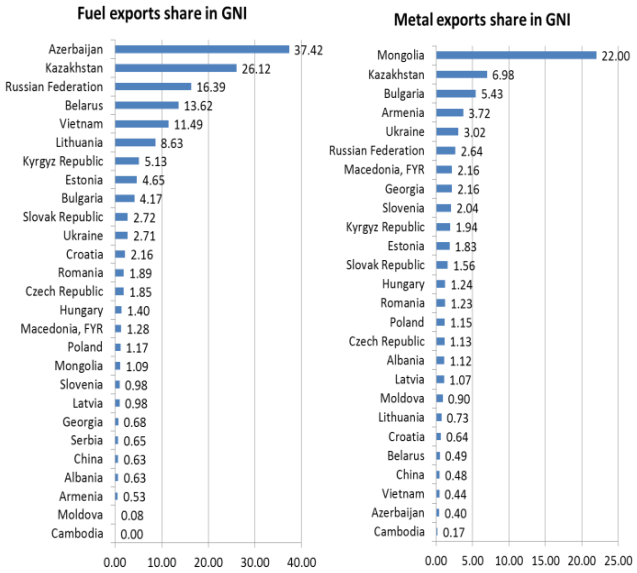


Fig. 2. Fuel and metal exports shares in GNI.

This paper contributes to the natural resources and economic growth empirical literature by examining the performance of transition economies over the period 1996-2010 in relationship with fuel and metal resources trade. The fixed effects estimation complements the cross section regression results. The outline of the paper is as follows. Section II presents literature review, Section III describes the estimation approach and data, Section IV presents the results and Section V concludes.

II. Literature Review

The nature of relationship between natural resources and economic growth is a long lasting debate topic. The attention to the topic was brought by [2]-[4] who empirically described that during the period 1970-1990 economies with a high ratio of natural resource exports in GDP in 1970 tended to have low growth rates. This negative relationship holds true in regression analysis after controlling for variables found to be important to economic growth, such as initial income, openness, investments, rule of law, trade policy, and education.

Reference [5] argue that panel data allows better control for unobserved fixed effects, dynamics and endogeneity and found that natural resource exports have positive rather than a negative effect on subsequent economic growth. Reference [6] uses new measure of resource endowment the World Bank's per capita natural resource wealth data and finds no evidence of negative indirect effects on economic growth over the period 1970-2000. Reference [7] claims the resource curse is elusive and finds positive effect from oil and mineral wealth on GDP per capita levels.

There is also significant amount of literature on detrimental effects of natural resources through institutional channel. Natural resources considerably increase the chances of civil conflict in a country [8]. Within natural resources oil, particularly found to be detrimental. Oil exports share in GDP have significant negative relationship with country's political institutions [9]. The negative association between oil and democracy is persistent even after including country fixed effects [10]. The discovery of oil significantly decreases a country's 30-year change in democracy measured by the Polity Index [11]. Interestingly, there are no reported cases on detrimental effects of metal exports on institutional variables.

TABLE I: Summary of Some Empirical Literature on Natural Resource Types and Growth

Author (year)	Variable	Association with growth
Sachs and Warner (1997)	Primary products export to GDP in 1970 (the variable includes food, agricultural raw materials, fuels and ores and metals export, which correspond to SITC categories 0, 1, 2, 3, 4 and 68)	negative
Isham *et al*. (2005)	Manufactures index	Insignificant
	Diffuse index	Insignificant
	Point source index (metals and fuels)	negative
	Coffee and cocoa index	mainly negative
	Primary exports in GDP in 1971 due to Sachs and Warner (1995)	positive
Sala-i-Martin and Subramanian (2003)	Natural resources export share in total merchandise export (or in GDP) Includes fuels, ores and minerals, food, agricultural raw materials export	Insignificant for growth, but negative for rule of law
	Fuel and minerals export share in total merchandise export (or in GDP)	Insignificant for growth, but negative for rule of law
	Food and agricultural raw materials export share in total merchandise export (or in GDP)	Insignificant for growth, and insignificant for rule of law
	Fuels export share in GDP	Positive for growth, negative for rule of law
	Minerals export share in GDP	Negative for growth and negative for rule of law
	Food export share in GDP	Insignificant
	Agricultural raw materials share in GDP	Insignificant
	Oil dummy	Positive for growth, negative for rule of law
Brunnschweiler (2011)	Oil production	Positive
	Oil reserves	Positive
Alexeev and Conrad (2011)	Dummy for transition economies	Positive for growth negative for institutions.
	Natural resource indicator	Insignificant
	Interaction term of transition economy and natural resources	Insignificant

As data on transition economies became publicly available the debate whether natural resources are benefited or harmed growth has also extended to transition economies. Countries that had been longer under socialist government and rely more on natural resources experienced less institution building over the first decade of transition [12]. There is negative correlation between natural resource abundance and economic growth with corruption and a neglect of basic education being as the main reasons behind [13. However, these regression results are not robust and change with

inclusion and exclusion of different variables. Reference [14] in contrast, using oil production and reserves data shows that oil had strong and robust positive growth effects during 1996-2006 and the result is confirmed for different types of oil ownerships. Examination of "point-source" resource abundance and economic growth by applying cross-country regressions for two different years, 1996 and 2005 find little evidence that resource abundant transition economies are significantly worse off [7]. The interesting finding is that it is transition not natural resources are appeared to be detrimental for institutional variables. These results concluded by authors as contrary to those of [13], but are consistent with [14].

Some empirical works differentiating between various types of resources has appeared. For instance, resources are classified into diffuse resources (livestock and agricultural produce grown on small family farms), point source resources (fuels, minerals and plantation crops), and coffee and cocoa. The naming of point source natural resources comes because these resources are extracted from a narrow geographic or economic base. Through two stage equation system they show that for developing countries point source export dependence and coffee and cocoa export dependence are negatively associated with institutional variables, which in turn are significant determinants of growth [15]. Reference [16] went further in disaggregating resources into fuels, ores and minerals, food, and agricultural raw materials four types based on export data from World Bank's World Development Indicators (WDI). While fuel exports found to be significant positive effect on economic growth metal exports had significant negative effect. However, these results were ignored and the paper focuses on aggregate results when fuels and metals are paired in one group and show significant negative effect on growth even after institutions are controlled.

III. Estimation Approach and Data

This paper differs from other papers mentioned in previous section in at least three important aspects. First, the relationship between growth and natural resources assumed to vary depending on which type of resource is considered. It is common in natural resource literature to take natural resource variable in aggregated form, with all types of resources being summed up in one variable. Such aggregation might blur the different effects on growth by different types of resources. Following Sala-i-Martin and Subramanian (2003) natural resources exports are classified into 4 groups: 1) fuels, 2) ores and minerals (named as metals afterwards in this paper), 3) food, and 4) agricultural raw materials based on export data from WDI. Particularly the focus is on "naturally existing" resources such as fuels and metals, which in empirical literature are treated as same type of resource, for example as "point-source" by Isham *et al.* (2005).

Second, in addition to the cross-section regression analysis the panel data fixed effects model analysis, not typical in the natural resource-growth literature is applied. The idea of fixed effects is to control for "within-country variation" or country-specific factors affecting both natural resources and growth and thereby can help mitigate the omitted variable bias. Both methods can be complementary in understanding the relationship between natural resources and transition economies. Third, the empirical literature mentioned above uses resource export data in relationship to economic performance. This paper in addition to exports considers import data as well. Natural resources are not only exported but also imported in world economy. Consequently it is logical also to that imports of resource might have related to growth.

In order to compare transition economies with the rest of the world we estimate regressions using ordinary least squares (OLS) separately for the 24 transition economies sample and the sample containing 118 rest of the countries. Our main regression is quite simple.

$$G_i = \alpha + \beta_0 II_i + \beta_1 N_i + \beta_k X_k + \varepsilon_i \quad (1)$$

where i is a country index (it is dropped in discussion below), G is a per capita real GDP growth rate, II is a initial income level expressed by per capita real GDP in 1996, N is natural resource variable, and X is representing other conditioning variables commonly used in empirical analysis such as investment, price level, institutional quality, education and government expenditures.

Following Alexeev and Conrad (2011) the cross section analysis is also conducted on 138 countries using dummy variables for transition economies and interaction term of transition and natural resource variables.

$$G_i = \alpha + \beta_0 II_i + \beta_1 Tr_i + \beta_2 N_i + \beta_3 Tr_i N_i + \beta_k X_k + \varepsilon_i \quad (2)$$

where Tr_i is a dummy variable for transition economy, and N_i is representing natural resource variables. The effect of natural resources on the dependent variables is measured by $\beta_2 + \beta_3 Tr_i$. For non-transitional economies (Tr=0) it becomes simply β_2, while for the economies in transition (Tr=1) it equals $\beta_2 + \beta_3$.

The panel data analysis with fixed effects have the same variables as (1) but excludes initial income variable II as it is time invariant for countries. The panel with yearly data from 1996 to 2010 has missing entries which might cause inconsistency with estimators therefore panel with five-yearly averaged three periods 1996-2000, 2001-2005, and 2006-2010 have been constructed for 97 countries.

The group of transition economies, defined by World Bank, consists in total 29 transition economies of Central and Eastern Europe, former Soviet Union, and Asian transition economies such as Mongolia, China and Vietnam. The reason for choosing 1996 as a period start is related to data availability. For majority of transition economies the statistical data are became available after 1996. Our main variable of interest Ni has several variations. We tried export and import shares of natural resources in GNI, in GDP, and in merchandise exports and the results were almost same, thus in next section with results we present only export and import shares of fuel and metal exports in Gross National Income (GNI) following Sachs and Warner (1997)

This paper considers fuels resources to be different from metal resources. Fuel export, fuel import, metal export and metal import are included separately into empirical analysis. World Bank's WDI database provides fuel export, fuel

import, metal export and metal import as shares in merchandise export. We recalculate them as shares in GNI using merchandise export, merchandise import and GNI in current USD data from WDI. Per capita real GDP growth is calculated as a growth rate of national accounts based real GDP at constant 2005 national prices divided by population from data obtained from Penn World Tables version 8.0. Initial income, investment, consumer price level are also from Penn World Tables version 8.0: initial income is a natural logarithm of expenditure-side real GDP at chained PPPs in 1996; investment is a share of gross capital formation at current PPPs; and consumer price level variable is a price level of household consumption with USA's price level in 2005 indexed as 1. Education variable as adjusted net primary enrollment rate. Enrollment rates and years of schooling from Barro-Lee dataset have been tried as alternatives but had dismissed as strong relationship with initial income was observed. Institutional quality is represented by government spending as well as rule of law estimate. General government final expenditures share of GDP are from WDI database and Rule of Law estimate are from World Bank's Worldwide Governance Indicators.

IV. Empirical Analysis

A. Ordinary Least Squares Regressions

TABLE II.A: Summary Statistics for All Countries

Variables	Obs	Mean	St.Dev	Min	Max
rgdpnapopgr9610	132	2.71	1.99	-0.93	11.29
lnrgdpepop1996	132	8.56	1.24	5.44	10.75
fuelexpgni9600	132	0.05	0.11	0	0.57
metexpgni9600	132	0.02	0.05	0	0.40
fuelimpgni9600	132	0.04	0.04	0	0.26
metimpgni9600	132	0.007	0.006	0	0.03
ruleoflaw9600	132	0.07	0.94	-1.55	1.94
gengovfinexpgdp9610	132	15.38	4.94	5.04	29.35
adjprimenrlrt9610	132	89.88	12.17	40.51	99.98
csh_i9610	132	0.21	0.07	0.04	0.42
pl_c9610	132	0.63	0.32	0.16	2.77

Note: please refer to notes below Table III for detailed variables description

TABLE II.B: Summary Statistics for Transition Countries

Variables	Obs	Mean	St.Dev	Min	Max
rgdpnapopgr9610	24	5.15	2.26	2.34	11.29
lnrgdpepop1996	24	8.42	0.74	6.73	9.81
fuelexpgni9600	24	0.03	0.05	0	0.16
metexpgni9600	24	0.02	0.04	0	0.21
fuelimpgni9600	24	0.06	0.05	0.006	0.18
metimpgni9600	24	0.01	0.01	0	0.03
ruleoflaw9600	24	-0.28	0.67	-1.13	0.98
gengovfinexpgdp9610	24	15.69	4.92	5.20	22.12
adjprimenrlrt9610	24	93.80	3.28	86.45	98.18
csh_i9610	24	0.20	0.06	0.09	0.36
pl_c9610	24	0.43	0.13	0.25	0.72

Note: please refer to notes below Table III for detailed variables description

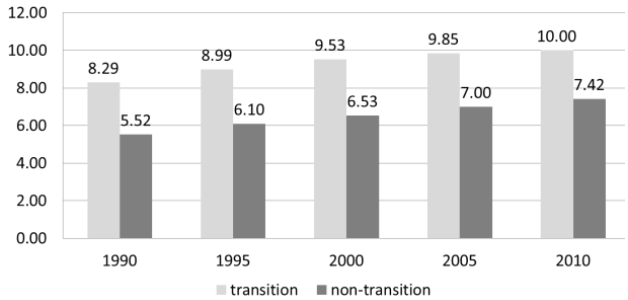
Ordinary least squares (OLS) regressions are estimated for three different samples: for 24 transition countries, for 108 other non-transition countries, and then for all 132 countries with dummy variables for transition economies and interaction term of dummy with natural resource variable. Summary of statistics for these three samples are provided in Table II.A, Table II.B and Table II.C. Comparison of these samples indicates that transition countries have no difference to other countries in amount of natural resource exports, but enjoyed higher growth rates, displayed lower estimates for rule of law, are better educated, and have lower consumer price levels.

TABLE II.C: Summary Statistics for Non-Transition Countries

Variables	Obs	Mean	St.Dev	Min	Max
rgdpnapopgr9610	108	2.16	1.45	-0.93	6.08
lnrgdpepop1996	108	8.60	1.33	5.44	10.75
fuelexpgni9600	108	0.05	0.11	0	0.57
metexpgni9600	108	0.02	0.05	0	0.40
fuelimpgni9600	108	0.03	0.03	0	0.26
metimpgni9600	108	0.01	0.005	0	0.03
ruleoflaw9600	108	0.15	0.98	-1.55	1.94
gengovfinexpgdp9610	108	15.31	4.97	5.04	29.35
adjprimenrlrt9610	108	89.01	13.22	40.51	99.98
csh_i9610	108	0.21	0.07	0.04	0.42
pl_c9610	108	0.68	0.33	0.16	2.77

Note: please refer to notes below Table III for detailed variables description

The cross-section OLS regression are estimated using statistical software STATA 13 and the results are presented in Table III. Upon the heteroscedasticity test the estimations are heteroscedasticity robust estimations. It appears that natural resource variables significantly explain cross-country variation in transition economies confirming the hypothesis that natural resource export played an important role in overcoming transition period difficulties. The opposite signs for fuels and metals confirm that exporting different types of resources indeed have different relationship with growth and this finding is robust after conditioning variables for institutional quality, inflation, investment, and education are controlled for. Institutional quality variables such as Rule of Law positively affects growth only in non-transition economies and insignificant for transition economies. Similarly, education and alternative variables such as schooling years, enrollment rates at different levels turned to be insignificant too for transition economies. It is possible that relatively high education level (see Fig. 3) obtained during socialist period of development resulted in insignificance of further increase in following transition years. Rise in consumer price index significantly detrimental for growth in transition economies, while for non-transition economies it is insignificant. The common view that government spending is hurtful for economic development in transition economies couldn't be supported in our findings.



Data source: Barro-Lee dataset

Fig. 3. Average years of schooling for transition economies.

Regression results with transition dummy variable show that transition economies on average between 1996 and 2010 enjoyed higher growth rates compared to other economies. The interaction term for transition dummy and natural resource variables is significant but has opposite signs for fuels and metals.

TABLE III: OLS REGRESSION FOR TRANSITION AND NON-TRANSITION ECONOMIES (DEPENDENT VARIABLE: PER CAPITA REAL GDP GROWTH)

Variables	Transition countries	Non-transition countries	All countries
lnrgdpepop1996	0.568 (0.913)	-0.798*** (0.261)	-0.749*** (0.257)
fuelexpgni9600	25.282*** (6.607)	1.678 (1.545)	1.579 (1.571)
metexpgni9600	-13.916** (5.979)	-5.049* (2.620)	-5.389** (2.768)
fuelimpgni9600	12.169 (14.897)	11.514* (6.900)	12.445* (7.190)
metimpgni9600	-99.027 (73.427)	-10.591 (25.745)	-13.635 (26.238)
ruleoflaw9610	0.630 (1.106)	0.999*** (0.234)	0.897*** (0.241)
gengovfinexpgdp9610	-0.005 (0.113)	-0.066** (0.033)	-0.066** (0.033)
adjprimenrlrt9610	-0.262** (0.122)	0.028* (0.015)	0.023 (0.015)
csh_i9610	18.027* (9.309)	6.530*** (2.053)	8.390*** (2.310)
pl_c9610	-0.705 (7.469)	-1.084*** (0.311)	-1.041*** (0.294)
transition dummy			3.378*** (0.918)
transition*fuelexpgni9600			21.948*** (8.885)
transition*metexpgni9600			-10.156** (4.971)
transition*fuelimpgni9600			-3.585 (11.114)
transition*metimpgni9600			-100.055** (48.316)
N obs	24	108	132
Prob>F	0.000	0.000	0.000
R squared	0.733	0.283	0.573

Notes: Robust standard errors in parentheses. *, **, *** statistically significant at 10%, 5%, 1% levels. Heteroscedasticity robust regression estimated by Stata 13.

Variables: per capita real GDP growth-national accounts based per capita real GDP (in mil. 2005USD) average growth rate for 1996-2010 calculated from Penn World Tables 8.0, initial income variable lnrgdpepop1996-natural logarithm of expenditure-side real GDP at current PPPs (in mil. 2005USD) in 1996 from Penn World Tables 8.0, fuelexpgni9600-fuel exports share in GNI (current USD) calculated from WDI database, metexpgni9600-average ores and metals export share in GNI (current USD) calculated from WDI database for 1996-2000 period, fuelimpgni9600-average fuel import share in GNI (current USD) calculated from WDI database for 1996-2000 period, metimpgni9600-ores and metals import share in GNI (current USD) calculated from WDI database for 1996-2000 period, ruleoflaw9610-average estimate of rule of law from Worldwide Governance Indicators for 1996-2010, gengovfinexpgdp9610-average share of general government final expenditures in GDP for 1996-2010 from WDI database, education variable adjprimenrlrt9610-average adjusted primary enrollment rate for 1996-2010 period from WDI database, investment variable csh_i9610-average share of gross capital formation at current PPPs for 1996-2010 from Penn World Tables 8.0, consumer price level variable pl_c9610-average price level of household consumption (price level of USA output-side GDP in 2005=1) for 1996-2010 period from Penn World Tables 8.0, transition dummy-transition countries have value of 1 and other countries value of 0. Penn World Tables 8.0 and World Bank's databases are accessed in December 2014.

B. Panel Data Analysis with Fixed Effects Model

The results of fixed effects estimation for separate panels of transition and non-transition economies are presented in Table IV. Fuels export share in GNI again as it was with OLS significant and positive to growth. However, negative association of metals with growth is no more significant. The significant negative effect estimated in cross-country regression disappears, when country specific effects are controlled for. Fuels import appear to have negative relationship growth for transition economies. In unbalanced panel both group of countries benefit from metal import, and the coefficient for transition countries is much higher. This result can be explained as follows. The developed manufacturing sector would raise the demand for metal resources, resulting in high metal imports and thereby contribute to growth. Apparently, high exports of metal might represent poor developed manufacturing sector so the country have no other choice than export its resources in raw form. Regarding other conditioning variables, raising institutional quality by improving Rule of Law estimate have no significance for transition countries. While capital accumulation displays positive influence the rise in consumer price index still negatively associated with growth in both groups.

TABLE IV: FIXED EFFECTS ESTIMATION FOR TRANSITION AND NON-TRANSITION ECONOMIES, 1996-2010 (DEPENDENT VARIABLE: PER CAPITA REAL GDP GROWTH)

Variables	Unbalanced yearly panel, 1996-2010		Balanced five-year three periods: 1996-2000, 2001-2005, and 2006-2010	
	Transition countries	Non-transition countries	Transition countries	Non-transition countries
fuelexpgni	34.724*** (6.161)	11.293** (4.810)	29.339*** (6.811)	6.955 (6.340)
metexpgni	-9.601 (28.062)	4.110 (6.268)	-10.292 (23.685)	1.237 (8.611)
fuelimpgni	-30.659*** (10.737)	-8.214 (6.071)	-48.839*** (16.649)	-1.022 (8.699)
metimpgni	127.543** (52.841)	62.175** (27.141)	55.128 (66.603)	42.175 (40.749)
ruleoflaw	-5.899*** (1.930)	2.220*** (0.746)	-4.434** (2.117)	1.515* (0.937)
gengovfinex pgdp	-0.213 (0.162)	-0.347*** (0.073)	0.139 (0.205)	-0.225** (0.093)
adjprimenrlrt	0.137 (0.104)	0.030 (0.022)	0.232* (0.119)	0.031 (0.026)
csh_i	46.630*** (7.761)	17.116*** (2.903)	22.432* (10.507)	12.165*** (4.070)
pl_c	-16.912*** (2.588)	-3.193*** (0.657)	-8.457** (3.269)	-4.855*** (0.978)
N obs	232	987	51	246
Countries	24	108	17	82
Prob>F	0.000	0.000	0.000	0.000
R squared overall	0.246	0.057	0.434	0.110

Notes: Standard errors in parentheses. *, **, *** statistically significant at 10%, 5%, 1% levels.

Dependent variable in yearly panel is per capita real GDP yearly growth, dependent variable in five-year 3 periods (1996-2000, 2001-2005, and 2006-2010): per capita real GDP's five-year average growth.

Variables: per capita real GDP growth-national accounts based per capita real GDP (in mil. 2005USD) growth rate

for 1996-2010 calculated from Penn World Tables 8.0, fuelexpgni-fuel exports share in GNI (current USD) calculated from WDI database, metexpgni- ores and metals export share in GNI (current USD) calculated from WDI database, fuelimpgni-average fuel import share in GNI (current USD) calculated from WDI database, metimpgni-ores and metals import share in GNI (current USD) calculated from WDI database, ruleoflaw- estimate of rule of law from Worldwide Governance Indicators, gengovfinexpgdp-share of general government final expenditures in GDP from WDI database, education variable adjprimenrlrt-adjusted primary enrollment rate WDI database, investment variable csh_i-share of gross capital formation at current PPPs from Penn World Tables 8.0, consumer price level variable pl_c-price level of household consumption (price level of USA output-side GDP in 2005=1) from Penn World Tables 8.0. Penn World Tables 8.0 and World Bank's databases are accessed in December 2014.

V. Conclusions

Previous empirical works on natural resources and growth are draw their conclusions based on aggregated form of natural resources that incorporates both fuels and metals in one group. Our estimations confirm that these resources indeed might have different relationship with growth and it might be useful to differentiate between fuels and metals.

Cross-section regression analysis indicates that from 1996 to 2010 period the economic growth of transition economies have benefited from fuel exports but suffered from metal exports. This result holds even after controlling for different conditioning variables such as institutional quality, education, investment, and consumer price level. The fixed effects estimation complements the cross-sectional regression results suggesting that negative association of metal export with growth in transition countries found in cross-section analysis might be attributed to country specific time persistent characteristics. High shares of fuel export does not necessarily indicate the country's inability to produce value-added goods in manufacturing sector, it can be simply result from abundant fuel resources. In contrast, high export share of metals can be attributed to lack of industrial capabilities to transform these resources into value-added manufacturing goods. Furthermore it is found that it is not fuel exports, but fuel imports that hurt the economy. Such differentiation between fuel and metal resources requires some explanation. It might be related to how this particular resource is engaged in production process. While fuel resources consumed instantaneously as energy source, metal resources serve as inputs and can be transformed continuously to value-added products and that transformation process can be extended across countries and across time with being exported and then imported repeatedly. Second, fuel exports might benefited the growth in transition economies because the manufacturing sector as well as other sector were badly suffered during early years of transition, so there were no other choice left than exporting what these countries had and that has contributed to their economic growth. The aim of this paper to show empirically that exporting fuels might have different outcome compared to exporting metals, however further research to provide reasonable explanation both theoretically and empirically is required.

Appendix

List of Transition Countries in Cross-Section OLS and Yearly Panel Data Fixed Effects Analysis (24 Countries)

ID	*Country name*	*ID*	*Country name*	*ID*	*Country name*
2	Albania	62	Estonia*	128	Moldova*
9	Armenia	71	Georgia*	130	Mongolia*
13	Azerbaijan*	85	Hungary*	153	Poland*
18	Belarus	98	Kazakhstan*	157	Romania*
29	Bulgaria*	105	Kyrgyzstan*	158	Russia
33	Cambodia*	107	Latvia	171	Slovenia*
41	China	113	Lithuania*	201	Ukraine
48	Croatia*	116	Macedonia*	209	Vietnam*

Note: ID is a number of a country according to World Bank's WDI database
* Countries included in a balanced panel with three five-year periods

List of Other Countries in Cross-Section OLS and Yearly Panel Data Fixed Effects Analysis (108 Countries)

ID	*Country name*	*ID*	*Country name*	*ID*	*Country name*
8	Argentina	76	Grenada*	142	Nigeria*
11	Australia*	78	Guatemala*	144	Norway*
14	Bahamas*	79	Guinea*	145	Oman*
15	Bahrain	83	Honduras*	146	Pakistan
16	Bangladesh	84	Hong Kong*	148	Panama
17	Barbados*	86	Iceland*	150	Paraguay*
19	Belgium*	87	India*	151	Peru*
20	Belize*	88	Indonesia*	152	Philippines*
21	Benin*	89	Iran*	154	Portugal*
23	Bhutan*	91	Ireland*	156	Qatar
24	Bolivia*	93	Israel*	159	Rwanda*
26	Botswana*	94	Italy*	163	Saudi Arabia
28	Brunei	95	Jamaica	164	Senegal*
30	Burkina Faso*	96	Japan*	174	South Africa*
34	Cameroon	97	Jordan*	176	Spain*
35	Canada	99	Kenya*	177	Sri Lanka
37	Central African Republic	102	Korea, Rep*.	183	Suriname
40	Chile	104	Kuwait*	184	Swaziland*
42	Colombia*	108	Lebanon*	185	Sweden*
46	Costa Rica	114	Luxembourg*	186	Switzerland*
47	Cote d`Ivoire*	115	Macao*	187	Syria*
51	Cyprus*	117	Madagascar	188	Tajikistan
53	Denmark*	118	Malawi*	189	Tanzania*
55	Dominica*	119	Malaysia	190	Thailand
57	Ecuador*	121	Mali*	192	Togo*
58	Egypt*	122	Malta	194	Trinidad &Tobago*
59	El Salvador*	124	Mauritania	195	Tunisia*
63	Ethiopia*	125	Mauritius*	196	Turkey*
65	Fiji*	126	Mexico*	200	Uganda
66	Finland*	132	Morocco*	203	United Kingdom*
67	France*	133	Mozambique*	204	United States*
69	Gabon	135	Namibia*	205	Uruguay*
70	Gambia, The*	136	Nepal	208	Venezuela*
72	Germany*	137	Netherlands*	212	Yemen*
73	Ghana*	139	New Zealand*	213	Zambia*
74	Greece*	141	Niger*	214	Zimbabwe

Note: ID is a number of a country according to World Bank's WDI database
* Countries included in a balanced panel with three five-year periods

Acknowledgment

Dashjamts Bayarmaa thanks Prof. Horii Nobuhiro (Kyushu University) and Prof. Hitoshi Osaka (Kyoto Sangyo University) for insightful guidance and helpful comments. Author also thanks participants of Asia-Pacific Economic and Business History Conference 2013 for questions and comments.

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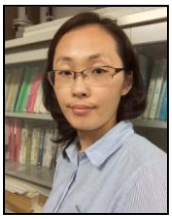

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