

## Domestic Material Consumption from Cultural Perspective in European Countries

Inna Čábelková

Charles University in Prague, Czech Republic  
inna.cabelkova@fhs.cuni.cz

Doi:10.5901/mjss.2014.v5n23p1791

### Abstract

*The reduction of domestic material consumption (DMC) nowadays is an important prerequisite for sustainability of economic development on one side and the protection of the environment on the other side. This paper contributes to cross-country direction of analysis by studying the influence of cultural differences on DMC. This paper presents multivariate regression analysis of cultural factors influencing domestic material consumption. We find that uncertainty avoidance index and index indulgence versus restraint are statistically significantly related to domestic material consumption. We control for GDP per capita, test for multicollinearity and work with outliers. Our results are in line with existing research on cultural differences in consumer behavior.*

**Keywords:** domestic material consumption (DMC), cultural values, sustainable development.

### 1. Introduction and Brief Literature Survey

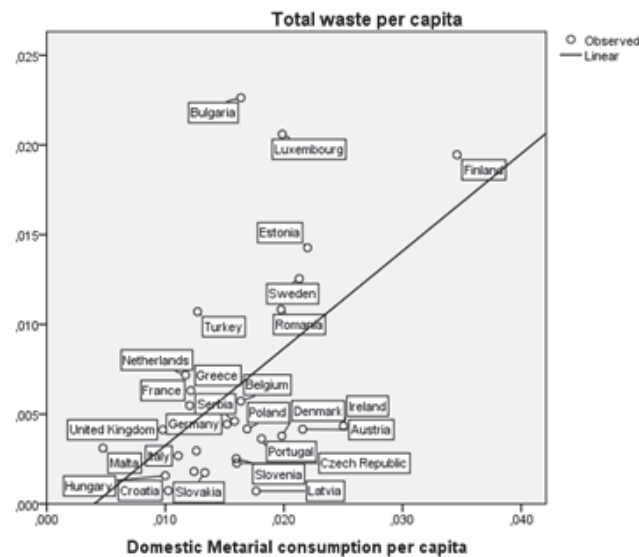
At the end of the last century the attention of ecologists was driven to the idea, that economic growth should not necessary be detrimental for the environment. This idea was revolutionary for those ecologists who demonstrated against economic growth and lead to higher support of economic development we now enjoy. The theory, captured in the Kuznets curve (Kuznets, 1955), suggested that pollution first increases and then decreases with income forming inversed U shape relationship. In this respect higher incomes might be actually supportive for the ecology producing less pollution.

While in general the theory was well accepted (see Borghesi, 2001; Dinda 2004; He, 2007), some papers suggest that the mapping of the curve is sensitive to the methodology, sample of countries and time period chosen (see; Selden and Song, 1994; and Hill and Magnani, 2002). The overall attitude of academics now is rather mixed.

There are four most common arguments supporting the shape of Kuznetz curve. The first one suggests that people assign an increasing value to the environment as their income increases (see Pezzey, 1992, Selden and Song, 1994 and Baldwin, 1995) and therefore are willing to invest more to preservation of environment as their incomes increase. Secondly, environmental pollution, virtually unavoidable at the early stages of economic development, may result in change in the structure of the economy from rural, agricultural economy to knowledge based technology intensive industrial economy (see Grossman and Krueger, 1993). The third set of explanations concerns institutional, political and cultural factors (see Carson, 2010, Ng and Wang, 1993). Fourthly, R&D spending and technological progress is correlated with the wealth of a nation (Komen et al., 1997). Better technologies lead to more efficient use of resources and can eventually improve environment.

The efficiency of use of resources is important for two reasons. Firstly it allows using less primary resources in producing the same outputs thus preventing environment devastation and supporting sustainable economic growth. Secondly less primary materials used reduce the volumes of waste produced (for relation of waste per capita to domestic material consumption in European countries see Graph 1).

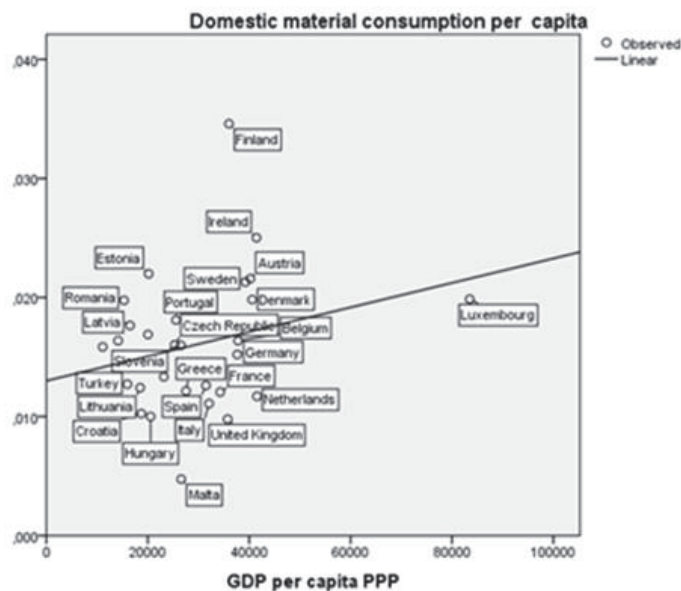
**Graph 1.** Total waste per capita with respect to domestic material consumption per capita (tis. tons) in European countries



**Source:** own computations based on Eurostat data

While the need to reduce material use through technological innovations and other procedures is well accepted in the literature, the differences in domestic material consumption in countries are still to be discussed. One of the most frequently suggested indicators for these differences is the level of economic development measured by GDP per capita (see Graph 2).

**Graph 2.** Domestic material consumption per capita (DMC, 2010, tis. tons) versus GDP per capita (PPP, USD, 2010) in European countries



The interesting position on this graph is taken by Luxembourg. In order to prove the robustness of our statistical analysis in the following chapters we will consider Luxembourg as possible statistical outlier (see chapet 3, results and discussion).

**Table 1.** Pearson correlation between GDP per capita and DMC per capita. European countries.

		DMC per capita
GDP per capita PPP	Pearson Correlation	0,251
	Sig. (2-tailed)	0,190
	N	29

However, GDP per capita itself is not statistically significantly correlated to DMC (see table 1), which poses further questions on reasons for the substantial differences in DMC per capita. As table 2 shows, some European countries with similar GDP per capita (ranging from 35 000 USD to 41 000 USD) present significant variations in domestic material consumption per capita from almost 10 tons in the United Kingdom to almost 35 tons in Finland (see table 2). These differences need to be explained.

**Table 2.** GDP and domestic material consumption (DMC) in some European countries

	GDP per capita (PPP) 2010, USD	DMC per capita 2010, tons
United Kingdom	35 752	9,8
Belgium	37 793	16,4
Sweden	39 251	21,3
Ireland	41 435	25,0
Finland	36 015	34,6

Data source Eurostat.

The literature on material consumption, however, rather focuses on the trends of consumption in individual countries over time (see Xiaoqiu Chen and Lijia Qiao, 2001; Scasny et al., 2003; Pedersen, 2002; Mäenpää and Juutinen, 2001; Muukkonen, 2000; De Marco et al., 2000; Schandl et al., 2004; Isacson et al., 2000; Schandl and Schulz, 2002). The studies analyzing cross country differences in material consumption are very few (Adriaanse et al., 1997; Matthews et al., 2000; Fischer-Kowalski and Amann, 2001, Behrens et al., 2007) and none of these deal with cultural issues. The literature on consumption trends on the other hand focuses on the preferences of consumers (see Azizan and Suki 2014, Vazifehdoost et al. 2014) with little attention paid to material consumption.

In this paper we study cross country differences in domestic material consumption from cultural point of view. We present multivariate regression analysis of cultural factors influencing domestic material consumption. We find that uncertainty avoidance index and indulgence-versus-restraint index are statistically significantly related to domestic material consumption. We control for GDP per capita, test for multicollinearity and work with outliers.

## 2. Methods and Data

In this paper we present econometric models for domestic material consumption and test the relations between domestic material consumption on one hand and cultural dimensions of Geert Hofstede (Hofstede et al. 2010) on the other hand. To take into account economic factors we include GDP per capita and control variable. We estimate the following models:

$$DMC = a_0 + a_1IVR + a_2PDI + a_3IDV + a_4MAS + a_5UAI + a_6LTOWVS + a_7GDP + \xi \quad (1)$$

Where

*DMC* – Domestic material consumption per capita, 2010. Domestic Material Consumption DMC (metric tons) is defined as the total amount of materials directly used in the economy (used domestic extraction plus imports), minus the materials that are exported. Data source –Eurostat.

*IVR - Indulgence versus Restraint.* Indulgence stands for a society that allows relatively free gratification of basic and natural human drives related to enjoying life and having fun. Restraint stands for a society that suppresses gratification of needs and regulates it by means of strict social norms (see Hofstede et al. 2010)

*PDI – Power Distance Index.* This dimension expresses the degree to which the less powerful members of a society accept and expect that power is distributed unequally. The fundamental issue here is how a society handles inequalities among people. People in societies exhibiting a large degree of power distance accept a hierarchical order in which everybody has a place and which needs no further justification. In societies with low power distance, people strive to equalise the distribution of power and demand justification for inequalities of power (see Hofstede et al. 2010)

**IDV – Individualism versus Collectivism.** The high side of this dimension, called individualism, can be defined as a preference for a loosely-knit social framework in which individuals are expected to take care of only themselves and their immediate families. Its opposite, collectivism, represents a preference for a tightly-knit framework in society in which individuals can expect their relatives or members of a particular in-group to look after them in exchange for unquestioning loyalty. A society's position on this dimension is reflected in whether people's self-image is defined in terms of "I" or "we" (see Hofstede et al. 2010).

**MAS – Masculinity versus Femininity.** The masculinity side of this dimension represents a preference in society for achievement, heroism, assertiveness and material rewards for success. Society at large is more competitive. Its opposite, femininity, stands for a preference for cooperation, modesty, caring for the weak and quality of life. Society at large is more consensus-oriented (see Hofstede et al. 2010).

**UAI - Uncertainty Avoidance Index.** The uncertainty avoidance dimension expresses the degree to which the members of a society feel uncomfortable with uncertainty and ambiguity. The fundamental issue here is how a society deals with the fact that the future can never be known: should we try to control the future or just let it happen? Countries exhibiting strong UAI maintain rigid codes of belief and behaviour and are intolerant of unorthodox behaviour and ideas. Weak UAI societies maintain a more relaxed attitude in which practice counts more than principles (see Hofstede et al. 2010).

**LTOWVS – Long-Term Orientation** measured according to World Value Survey data. Long-term oriented societies foster pragmatic virtues oriented towards future rewards, in particular saving, persistence, and adapting to changing circumstances. Short-term oriented societies foster virtues related to the past and present such as national pride, respect for tradition, preservation of "face", and fulfilling social obligations (see Hofstede et al. 2010).

**GDP – Gross Domestic Product per capita**, in US dollars PPP, 2010.

For this analysis we use the sample of 30 European countries. Namely we work with the data from Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Poland, Portugal, Romania, Serbia, Slovakia, Slovenia, Spain, Sweden, Turkey, United Kingdom

### 3. Results and Discussion

The regression output for model 1 is presented in Table 3.

**Table 3.** Key regression output. Dependent variable – domestic material consumption per capita

Model	Coefficients	Std. Error	Sig.	VIF
(Constant)	-,015	,037	,691	
Power Distance	-7,660E-005	,000	,287	2,436
Individualism	,000	,000	,106	2,488
Masculinity	-2,449E-005	,000	,580	1,223
Uncertainty Avoidance	,000*	,000	,064	1,834
Long Term Orientation	,000	,000	,189	1,550
Indulgence versus Restraint	,000*	,000	,098	3,046
lnGDP	,006	,004	,118	2,991
R <sup>2</sup>	,403			

\*- significant on 10% level, \*\* - significant on 5% level

**Source:** own calculations

Out of six cultural variables two proved to be statistically significant on the 10% level (uncertainty avoidance and indulgence versus restraint). The thing variable, individualism, was at the edge of significance (see table 3). The results suggest, that the more the country tends to avoid uncertainty and the more indulgent the country is (as opposed to restraint), the higher is the domestic material consumption per capita controlling for GDP per capita.

In the case of uncertainty avoidance, our results are in line with De Mooij (2004, 2013), de Mooij and Hofstede (2002), where the authors find that uncertainty avoiding cultures pay more attention to purity and cleanness. For this they buy new cars rather than used ones, use more laundry detergents, and drink more bottled mineral water instead of drinking tap water even in the case if the latter is of a good quality. These cultures are also slower in introducing new

technological devices such as internet and mobile phones (Hofstede et al 2010)

The significant relation of indulgent values to DMC is easy to explain. In consumer behavior indulgence is related to impulse buying (Mukhopadhyay, and Johar, 2009, Stern H. 1962), which tends to enforce consumerism and unnecessary purchases thus increasing consumption of raw materials used for their production.

The results proved to be valid even if we exclude Luxembourg as an outlier. For the reason we consider Luxembourg as a possible outlier see Graph 2. For the results of multinomial regression without Luxembourg see table 4. Comparing the tables 3 and 4 we can conclude that the results presented above are robust with respect to taking out Luxembourg as an outlier. All the significant variables stay to be significant on similar significance levels.

**Table 4.** Key regression output. Dependent variable – domestic material consumption per capita

Model	Coefficients	Std. Error	Sig.	VIF
(Constant)	-,027	,050	,594	
Power Distance	-7,391E-005	,000	,317	2,426
Individualism	,000	,000	,106	2,676
Masculinity	-2,568E-005	,000	,572	1,228
Uncertainty Avoidance	,000*	,000	,069	1,834
Long Term Orientation	,000	,000	,203	1,541
Indulgence versus Restraint	,000*	,000	,100	3,430
lnGDP	,008	,005	,163	3,916
R <sup>2</sup>	,397			

\*- significant on 10% level, \*\* - significant on 5% level

**Source:** own calculations

#### 4. Conclusion

The reduction of domestic material consumption (DMC) nowadays is an important prerequisite for sustainability of economic development on one side and the protection of the environment on the other side. There are numerous studies mapping the changes in material use in separate countries relating is to the level of economic development. The literature explaining cross country differences in DMC is less abundant due to methodological problems with cross-country comparable data existing till 2005. This paper contributes to cross-country direction of analysis by studying cultural differences in DMC. We reflect on Kuznetz curve to show the possible effect of economic development on environment protection including reduction of DMC and, therefore waste per person. Than we employ cross-country multinomial regression analysis to study the influence of Hofstede's cultural dimensions on domestic material consumption. Our results suggest that that the more the country tends to avoid uncertainty and the more indulgent the country is (as opposed to restraint), the higher is the domestic material consumption per capita controlling for GDP per capita. Our results are in line with existing research on cultural differences in consumer behavior.

#### References

- Adriaanse,A., Bringezu,S., Hammond,A., Moriguchi,Y., Rodenburg,E., Rogich,D. and Schütz,H., 1997. *Resource Flows: The Material Basis of Industrial Economies*. World Resources Institute, Washington DC.
- Azizan, S. A. M., & Suki, N. M. (2014). The Potential for Greener Consumption: Some Insights from Malaysia. *Mediterranean Journal of Social Sciences*, 5(16), 11.
- Baldwin R. (1995) Does sustainability require growth? In I. Goldin, L.A. Winters (Eds.), *The Economics of Sustainable Development*, Beacon Press, Boston, MA, pp. 19–47
- Behrens, A., Giljum, S., Kovanda, J., & Niza, S. (2007). The material basis of the global economy: Worldwide patterns of natural resource extraction and their implications for sustainable resource use policies. *Ecological Economics*, 64(2), 444-453.
- Borghesi S. (2001) The environmental Kuznets curve: a critical survey. M. Franzini, A. Nicita (Eds.), *Economic Institutions and Environmental Policy*, Ashgate Publishing, Farnham, UK (2001), pp. 201–224
- Carson, R. T. (2010). The environmental Kuznets curve: seeking empirical regularity and theoretical structure. *Review of Environmental Economics and Policy*, 4(1), 3-23.
- De Marco,O., Lagioia,G. and Pizzoli Mazzacane,E., 2000. Materials Flow Analysis of the Italian Economy. *Journal of Industrial Ecology*, 4: 55-70

- De Mooij, M. (2013). *Global marketing and advertising: Understanding cultural paradoxes*. Sage Publications.
- De Mooij, M., & de Mooij, M. (2004). Consumer behavior and culture. *Consequences for global marketing and advertising*. Thousand Oaks, CA: Sage
- De Mooij, M., & Hofstede, G. (2002). Convergence and divergence in consumer behavior: implications for international retailing. *Journal of retailing*, 78(1), 61-69.
- Dietz, T., Rosa, E. A., & York, R. (2012). Environmentally efficient well-being: Is there a Kuznets curve?. *Applied Geography*, 32(1), 21-28.
- Dinda S. (2004), Environmental Kuznets curve hypothesis: a survey. *Ecological Economics*, 49 (4) pp. 431–455
- Fischer-Kowalski, M. and Amann, C., 2001. Beyond IPAT and Kuznets Curves: Globalization as a Vital Factor in Analyzing the Environmental Impact of Socio-Economic Metabolism. *Population and Environment*, 23: 7-47.
- Grossman G.M., and Krueger A.B. (1993), Environmental impacts of a north american free trade agreement. In P.M. Garber (Ed.), *The Mexico-U.S. Free Trade Agreement*, MIT Press, Cambridge, MA pp. 13–56
- He, J., 2007. Is the environmental Kuznets curve hypothesis valid for developing countries? A survey, *Working Paper 07–03*, University de Sherbrooke.
- Hofstede, Geert, Gert Jan Hofstede and Michael Minkov. (2010). *Cultures and Organizations: Software of the Mind*, 3rd ed. New York: McGraw-Hill.
- Isacson, A., Johnsson, K., Linder, I., Palm, V. and Wadeskog, A., 2000. Material Flow Accounts - DMI and DMC for Sweden 1987-1997. *Eurostat Working Paper* No 2/2000/B/2. Eurostat, Office for Official Publications of the European Communities, Luxembourg.
- Komen M.H., S. Gerking, H. Folmer (1997), Income and environmental R&D: empirical evidence from oecd countries. *Environment and Development Economics*, 2 (4) pp. 505–515
- Kuznets S. (1955), Economic growth and income inequality. *American Economic Review*, 45 (1) pp. 1–28
- Mäenpää, I. and Juutinen, A., 2001. Materials Flows in Finland. Resource Use in a Small Open Economy. *Journal of Industrial Ecology*, 5: 33-48
- Matthews, E., Amann, C., Fischer-Kowalski, M., Bringezu, S., Hüttler, W., Kleijn, R., Moriguchi, Y., Ottke, C., Rodenburg, E., Rogich, D., Schandl, H., Schütz, H., van der Voet, E. and Weisz, H., 2000. *The Weight of Nations: Material Outflows from Industrial Economies*. World Resources Institute, Washington, D.C.
- Mukhopadhyay, A., & Johar, G. V. (2009). Indulgence as self-reward for prior shopping restraint: A justification-based mechanism. *Journal of Consumer Psychology*, 19(3), 334-345.
- Muukkonen, J., 2000. TMR, DMI and material balances, Finland 1980-1997. *Eurostat Working Paper* Nr.2/2000/B/1. Eurostat, Office for Official Publications of the European Communities, Luxembourg
- Ng Y. K., and Wang J. (1993), Relative income, aspiration, environmental quality, individual and political myopia: why may the rat-race for material growth be welfare-reducing? *Mathematical Social Sciences*, 26 (1) pp. 3–23
- Pedersen, O.G., 2002. *DMI and TMR for Denmark 1981, 1990, 1997. An assessment of the Material Requirements of the Danish Economy*. Statistics Denmark.
- Pezzey, J., 1992. Sustainable development concepts: an economic analysis, *World Bank paper* No. 11425.
- Scasny, M., Kovanda, J. and Hak, T., 2003. Material flow accounts, balances and derived indicators for the Czech Republic during the 1990s: results and recommendations for methodological improvements. *Ecological Economics*, 45: 41-57.
- Schandl, H. and Schulz, N.B., 2002. Changes in United Kingdom's natural relations in terms of society's metabolism and land use from 1850 to the present day. *Ecological Economics*, 41: 203-221
- Schandl, H., Grünbühel, C.M., Thongmanivong, S., Pathoumthong, B. and Inthapanya, P., 2004. National and Local Material Flow Analysis for Lao PDR. SEARCA Publishing, Laguna.
- Selden, T.M. and D. Song (1994) Environmental quality and development: is there a Kuznets curve for air pollution emissions? *Journal of Environmental Economics and Management*, 27 (2) pp. 147–162
- Stern H. (1962), The significance of impulse buying today, *Journal of Marketing*, 26 pp. 59–62
- Vazifehdost, H., Rahnama, A., & Mousavian, S. J. (2014). Evaluation of the Influence of Fashion Involvement, Personality Characteristics, Tendency to Hedonic Consumption and Store Environment on Fashion-Oriented Impulse Buying. *Mediterranean Journal of Social Sciences*, 5(16), 223.
- Xiaoqiu Chen and Lijia Qiao, 2001. A Preliminary Material Input Analysis of China. *Population and Environment*, 23: 117-126.