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A RECIPE FOR DEMOCRACY? THE SPREAD OF THE EUROPEAN DIET AND POLITICAL CHANGE

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THE SPREAD OF THE EUROPEAN DIET

AND POLITICAL CHANGE[2]

This paper reveals the relationship between the improvement in human diet and the transition to democracy. The spread of a 'European diet' with a historically unprecedented high proportion of animal protein in the daily calorie intake is considered one of the factors of regime change since 1992. In contrast to other studies, I regard European diet as an outcome of a long historical transformation and show that an improvement in nutrition preceded regime change. Data on nutrient consumption around the world are from the Food balance sheet data from FAOSTAT. Based on this data I was able to define a European diet as containing animal-protein rich items (mostly, meat and dairy), alcohol beverages and sugar. Using OLS, factor analysis and SEM, the direct and indirect effects of the European diet on the chance of a transition to democracy were tested. The findings reveal that an improvement in diet affects regime change, but not vice versa.

JEL classification: I14, I15, Q18

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"The nourishment and education of their children is a charge so incumbent on parents for their children's good, that nothing can absolve them from taking care of it."

John Locke, "Two Treatises on Government"

Introduction

The quotation from John Locke in the epigraph might seem strange to a modern social scientist: nourishment and education are brought together as important indicators of social life. While education is widely used as a key indicator of social change in studying all societies, nourishment, or nutritional status is ignored by social scientists, with only a few exceptions [e.g., Blaydes and Kayser, 2011]. This paper aims to show that Locke was correct in emphasizing the importance of this indicator; nutritional status should not be neglected.

This paper argues that an improvement in diet—understood as an increase in the intake of protein-rich animal products—is a significant predictor of political change, namely democratization. Although intuitively it seems that causal arrow should go from democracy to higher nutritional status, I show that even after controlling for income growth and the liberalization of trade, diet affects political regime, but not vice versa. I argue that an improvement in diet is one of the structural prerequisites—along with income growth, education, urbanization—for a transition to democracy.

The relationship between nutrition and political regime can be considered in two temporal perspectives: the long-term and the short-term. The former focuses on historical developments which usually refer to the debate about the reasons of the onset of modernization in the West [e.g., Fogel, 2004, 2004a; Fogel and Costa 1997; Mokyr, 1992]. The latter explores the relationship between the regime type and various food-related issues in the contemporary world: globalization, food policy, income redistribution and clientelism [e.g., Penfold-Becerra, 2007; Mitchell, 2009; Hendrix and Haggard, 2015].

People in democracies have a more nutritious diet than in autocracies both in terms of calorie intake and quality of food (measured as the proportion of animal and vegetable products). For many reasons, a democratic diet is very attractive for people in autocracies. The Western life style is strongly associated with a European diet. The more people copy the Western lifestyle and consume a European diet, the more committed to democracy they might become.

This issue can be also addressed with the theory of globalization. It was argued that the liberalization of trade and foreign direct investment were associated with the promotion of democracy. Additionally, globalization was considered as a core upstream driver of the nutrition transition: increasing food imports, foreign investment in food production, change in food supply chains, and new forms of retail (e.g. supermarkets). People change their diet preferences and new diet patterns emerge. The westernization of diet—the reception of new food items and eating behaviours—can be considered as an outcome of globalization which might become a structural prerequisite for democracy, together with change in economic structure and income growth. So, what is the recipe for democracy?

Initially, people start consuming more calories. Then they replace 'cheap' calories (from carbohydrates) with 'expensive' ones (from proteins), and, finally, with 'very expensive' (from animal proteins). However, culture, traditional food patterns and localization may also affect diet types. Diet change from a traditional diet towards a 'European diet' is the part of modernization and globalization. In general, it is one of mechanisms behind existential security; the increase in calories and protein intake that makes people feel safer.

This paper provides a new interdisciplinary approach to connect social and natural sciences. Answering the question 'What is the recipe for democracy?' is a significant contribution to a better understanding of development paths. First, I distinguish the effect of diet from the one of income growth or trade liberalization on democratization. Food patterns and traditions are not only socially but biologically and geographically determined practices, for example, genetic intolerance to some foods or land suitability for certain crops. Second, this project helps to explore biological and sociological nature of human societies. From historical perspective, a society that can provide its members with a more nutritious diet would be considered more successful and more attractive. A European diet is likely to meet human expectations about a better life in terms of physical and economic security. Humans are seeking for a calorie rich, healthy and balanced diet; perhaps, on a biological level.

Using various FAOSTAT data on food balance sheets, the composition of diets in democracies and autocracies is explored, and a factor analysis is run to identify 'a European diet' as the diet with increased amount of animal proteins. Next, SEM is used to distinguish the effect of diet and income on political change.

This paper makes at least three contributions to the field. First, it contributes to the theoretical debate about the relationship between structure and institutions: whether institutions

lead to change in social structures, or change in social structures leads to institution maturity. Using the revised modernization theory [Inglehart, 1997; Welzel, 2013], I suggest that an improvement in diet is one of the key factors behind high levels of existential security. The latter change is crucial for value shift, the spread of emancipative values which are an important intermediate between people and the embeddedness of democratic institutions. Second, this study contributes to a better understanding of the causes of democratization on a structural level. I argue that the effect of diet on democratization can be separated from the effect of income growth. Moreover, the results provide an additional causal mechanism that links globalization and democratization. Third, this paper presents another proof that nutritional status has a great power as a new proxy for controlling material well-being, along with income.

The paper consists of four sections. Section 1 presents a theoretical framework on the relationships between food patterns and trends in social and political developments. Section 2 provides a description of the data. Section 3 includes the results of statistical tests using OLS, factor analysis, and SEM. Section 4 presents a discussion and the conclusion, where potential causal mechanisms are suggested.

Diet, food traditions and development

Diet is an essential part of the environments people are living in. One would expect that it should have a significant impact on social, cultural and political change, like water [Welzel, 2013], infections [Murray and Schaller, 2010] and geography [Diamond, 1997]. Although diet patterns and food traditions are not among key topics for social sciences previous studies provide us with some valuable findings. Most importantly, a European diet is the outcome of long-term historical transformation, which includes environmental, cultural, technological, political, economic and even genetic factors. Since its introduction, this diet has been a distinctive feature of the Western world, being one of the most persuasive signs of European modernization. The spread of the European diet was among the factors of deep social change; it contributed to the adoption of democratic political institutions that are strongly associated with the West. I focus on two dimensions in this research: (a) the historical perspective: the long-term effect of diet on social and political change, and (b) a short-term approach: regime type and income distribution.

Diet as an outcome of historical transformation

There are at least four dimensions in the literature on this topic: (1) the improvement of diet and economic growth in the long-run; (2) the revised modernization theory and the concept of existential security; (3) certain social effects of particular crops: wheat, rice, sugar cane, potato etc.; (4) Genes and food traditions.

Climate, geography and food production are closely connected. As Diamond argues [1997], the geographic conditions of Eurasia were the most favourable for early sedentary agriculture given the abundance of domesticated cereals and animals. Ever-increasing food production led to population growth and the emergence of the division of labour, social stratification, urban settlements, and ancient states. Diamond stresses the importance of the *amount* of food available to human populations: an abundance of food accelerates social development. But he did not focus on what kind of foods people eat, and whether it could have any social effect. Diet is a product of the adaptation to the environment and for two different populations a similar number of calories may be comprised of different foods.

Diet and economic growth

Robert Fogel argues that an improvement in diet was one of the key factors explaining the economic modernization of Europe in the modern era [Fogel, 2004; 2004a]. When malnutrition was the norm, it impeded economic growth. According to the Fogel's estimates, up to the bottom 20% of the population subsisted on such a poor diet that they were excluded from the labour force [Fogel, 1997: 53]. Those who were able to work suffered from early onset of chronic diseases and had to leave the labour market; mortality rates were high and life expectancy was low. In his theory of technophysio evolution Fogel argues that an improvement in nutrition (an increase in calorie intake) led to economic growth: well-fed people had better health and became more economically active and were included in the labour force. It had a double effect: people could work more effectively and they could work for longer [Fogel, 1997]. Positive change in calorie intake also brings important physiological changes: average height, weight and BMI increased dramatically. An improvement in diet was especially important for pregnancy and infancy. Well-fed infants and children, who do not suffer from calorie-protein malnutrition, do not have an impaired central nervous system function. It is critically important for cognitive development and for education. Malnutrition might be also associated with a socially passive position [Mokyr, 1992: 156-157], another finding consistent with Fogel's conclusion. Baten and Blum [2014] studied the determinants of 'the biological standard of

living' in 19th-20th centuries, using average heights as a proxy. They revealed that high-quality nutrition—an increased intake of meat and dairy products—was among the major determinants of height globally. Their sample included countries from Europe, Asia, Africa, America and Australia. Until the mid-20th century the local availability of cattle, milk and meat per capita determined the stature of populations. In another paper, Koepke and Baten [2008] focused on height determinants only in Europe but looking at deeper historical perspective—from 1 to 1800 AD—and got similar results. Methodologically, it is important to stress that Fogel shows that causality arrow goes from improvement of diet to economic growth, and not vice versa.

Diet and modernisation

The revised modernization theory by Inglehart [1997] argues that values are an important intermediate between people and democratic institutions. According to his theory, cultural change is inseparable from modernization. Two value dimensions are introduced: traditional/secular-rational and survival/self-expression. The traditional/secular-rational dimension reflects changes linked with the transition from agrarian to industrial society, associated with rationalization, bureaucratization, and secularization. Traditional societies emphasize religion, national pride, obedience and respect for authority, while industrial societies emphasize secularism, cosmopolitanism, autonomy, and rationality [Inglehart and Welzel, 2010: 553]. The survival/self-expression dimension reflects the polarization between survival values with an emphasis on order, economic security, and conformity and values of self-expression, which emphasize participation, subjective well-being, trust, tolerance, and quality of life [Inglehart and Welzel, 2010: 553]. The first change leads to the shift from traditional to secular and rational values, usually during the first phase of modernization. The second change is from survival values to self-expressive values and is associated with post-industrial modernization. The latter value change is followed by the creation of more open political institutions, the empowerment of people, and democratization.

The key element in this theory is the concept of existential security. Historically, all societies had very low levels of existential security and were exposed to numerous societal and personal risks: famine, epidemics, war, violence and high homicide rates. Not surprisingly, traditional societies had such common traits as collectivism, distrust of out-groups, intolerance, and religiosity [Norris and Inglehart, 2004]. Human life was seen as a source of hardship and suffering. A significant proportion of population were not sure whether they would eat tomorrow. With the progress of modernization, survival became secure enough to be taken for

granted. An increase in economic and physical security triggered value change. Now developed societies enjoy high levels of existential security. I argue that the change in diet—the abundance of food and an increase in the consumption of valuable and prestigious items—contributed significantly to the change in the perception of existential threats. When permanent and easy access not only to basic staple foods but also to expensive and valuable animal proteins is taken for granted, one may argue that the history of famine and chronic malnutrition for a given society is over.

Crops and social effects

Historically, different crops were not evenly distributed across the globe. For climatic and geographic reasons certain regions had dominant cultures that had a strong effect on societal life. For centuries, social structures were dependent on the peculiarities of the cultivation of staple crops, such as the division between rainfall and irrigation-based agriculture. Only with the progress of modernization did most societies gain access to new crops, plants and livestock breeds that enabled them to diversify their agriculture and food supplies. Below, the social effects of certain crops are outlined.

Wheat vs. rice

Talhelm et al. [2014] explored the value orientation of Chinese students from predominantly rice regions and wheat regions. Rice regions relied on irrigation and the collective effort of all the community members, even in case of individual plots. On the contrary, wheat farms could be run by individual households. Unsurprisingly, the study revealed the predominance of individual value orientation among students from 'wheat' regions.

Wheat vs. sugar cane

Fairbrother [2013] studied the causal relationship between religiosity and inequality using the ratio between wheat or sugar cane crops in a given country as an instrumental variable. The idea behind this variable is that wheat farms are run mostly by (free) individual households but sugar cane is produced mostly on plantations with extensive use of slave labour. Often the choice for the particular crop was determined by climate and land suitability for sugar cane crops.

Potatoes

Compared to many other crops and cereals, potatoes are very rich in calories. The introduction of potato was one of the greatest agricultural innovations in modern Europe. Nunn

and Qian [2011] argue that the introduction of the potato in Europe can explain 25–26% of the Old World population growth between 1700 and 1900 and 27–34% of the increase in urbanization [Nunn and Qian, 2011].

Genes and food traditions

Diet is often a product of adaptation to geographic environment, and genes often play an important role in this process. Research provides evidence of genetic adaptation to the (mal)digestion of alcohol, sugar, mushrooms, starch, beans, lipids, meats and other foods [Kozlov et al., 2005; Perry et al., 2007]. the frequency of genes responsible for the digestion of these products varies significantly among different populations. In many cases, the low or high frequency of a particular gene/allele is associated with specific food intolerance. One of the most elaborated cases in the literature in this field is the effect of milk (lactose intolerance). Globally, lactose intolerance is the norm: only about the third of adults have the ability to absorb lactose. However, among Europeans this figure doubles. Cook [2014; 2014a] has revealed the effect of lactose persistence on demographic growth early modern Europe. Milk and dairy products were essential and affordable source of proteins; thus, lactose tolerance would be a competitive advantage.

Democracy, globalization and diet

Globalization could be defined as the opening up of national economies to global market forces, and it is usually operationalized as trade liberalization and capital flows. Globalization introduces a new social order, new technologies, new powerful international actors (e.g., WTO), and new habits [Lang, 1999]. Inclusion in the 'new global order' leads to the exchange of goods and services and greater exposure to ideas and cultural patterns. Economists argue that globalization promotes economic growth—if countries are able to implement policies that attract foreign direct investments and use their competitive advantages in global trade and the global division of labour [e.g., Rodrik, 2008; Drehel, 2006]. Moreover, globalization is claimed to be a trigger for democratization. Scholars argue that trade openness, globalization-led economic growth, the diffusion of democratic ideas, and international pressure are the main causes of the globalization-democracy nexus [for an overview see e.g. Eichengreen and Leblang, 2008; Schwartzmann, 1998]. Rudra stresses the importance of social spending: the effect of the

globalization of democratization is positive but contingent; there is a positive impact only in countries with high or rising levels of social spending [Rudra, 2005].

Other literature stresses the effect of globalization on diet change. As barriers to trade between nations are reduced, global food markets emerge, with important consequences for consumers, farmers, retailers and processors [Popkin, 2006]. A 'nutrition transition' occurs: the transfer of diets and tastes from region to region, especially from the West to the East and South. Clear manifestations of this transition are new foodstuffs, brands, and recipes; processed foods, fast-food chains and supermarkets. In other words, there is a transition from traditional diets to a European diet. Scholars argue about 'the Westernization of diet', for example, in the case of Asia [Pingali, 2007]: a dramatic shift away from staples to dairy, fats, oils and fruit and vegetables. Emerging urban middle class consumers adopt Western diet patterns.

Globalization is a multi-dimensional but integrated process. Trade liberalization triggers economic growth, the diffusion of ideas and diet change. It is obvious that trade has spread foods and diets around the world, for example the "the Columbian exchange"—an exchange of diseases, food crops, and populations between the New World and the Old World after the voyage by Columbus in 1492 [e.g. Nunn and Qian, 2010]—and European colonial expansions. However, since the 1980s this process has intensified dramatically. We argue that dietary change had an independent effect on democratization and may be regarded as a causal mechanism.

Democracy and redistribution: regime type and nutrition patterns

This literature has a narrower temporal scope and focuses mostly on the comparative effectiveness of democracy and autocracy in social spending, reducing poverty and income redistribution. However, only a few papers concentrate on food related issues.

Is democracy good for the poor? In other words, the key point is whether the poor benefit from the transition to democracy. Ross [2006] provides a good overview on this issue. Sen [1999] argues that democracies enable the poor to punish governments that allow famines to occur; thus politicians have strong incentives to avoid famines. Moreover, citizens in democracies have more chances and opportunities for transmitting information to governments about their problems including famine and malnutrition. Democracies tend to produce more public goods than autocracies: they are electorally accountable and have to appease numerous groups of voters. Moreover, democracies have greater income redistribution. As Meltzer and

Richard [1981] argue, democracies bring more people with low incomes to the polls, and they force the government to redistribute income downwards. Autocracies favour the interests of the elite and are prone to less income redistribution [Acemoglu and Robinson, 2005]. In general, most authors agree that democracy is associated with greater income redistribution, higher rates of economic growth and thus more equal access to food. However, Ross [2006] counter-argues that it is not the poor but the middle class who are the winners in the transition to democracy. Using data on infant and child mortality he revealed that higher spending on public goods accrue to middle- and upper-income groups.

It is remarkable that the issue of diet has been neglected in these studies. Most authors were concerned with infant and child mortality [Ross, 2006; Boone, 1996; Zweifel and Navia, 2000], life expectancy [Besley and Kudamatsu, 2006], or manufacturing wages [Rodrik, 1999]. I identified just one paper using nutritional status as an alternative proxy for the measurement of material well-being [Blaydes and Kayser, 2011]. The authors test the effect of the regime type on income redistribution. They justify the choice of their dependent variables (calories and animal calories, per capita per day) by the claim that in developing countries it might be a more appropriate indicator of income distribution. While most commodities—money, jewellery, land, or real estate—can be owned by a small share of population, calories are not likely to be accumulated in the wealthiest 1% of the population. The conclusion is that democracy (compared to autocracies and hybrid regimes) leads to a fairer redistribution of income and higher social spending; democracies do better in converting growth into calories (and animal calories). The authors make a distinction between calories and 'high-quality' animal calories, however they do not put much emphasis on the substantial difference between various diet patterns, at least in terms of balance between carbohydrates, proteins and fats although, as shown above, the role of proteins must not be underestimated.

Social inequality may also affect diet disregarding regime type. Brooks, Simpson and Raubenheimer [2010] studying the reasons for obesity in the USA and Australia, stressed the importance of the price of proteins compared to carbohydrates. According to their findings, it is much more expensive to meet the same energy/calories intake with protein-rich products than with carbohydrate-rich. Therefore, the poorer classes prefer cheap carbohydrates (like bread, pasta, and maize, starchy and sugary meals) to expensive proteins; that is why in many developed countries obesity is associated with low classes.

Autocracies try to catch-up democracies in terms of food supplies: they implement various food policies to secure food supplies to the poorer classes. For example, governments in autocracies have frequently sought to reduce food prices paid by urban consumers striving to prevent urban unrest [Hendrix and Haggard, 2015]. Among widely used mechanisms are marketing boards, consumer subsidies or price controls, and export taxes or even bans [Hendrix and Haggard, 2015: 146]. Numerous state sponsored programs of food subsidies play a special role in autocracies and hybrid regimes. There are reports on such programs in the Dominican Republic [Mitchell, 2009], Mexico and Brazil [Ansell and Mitchell, 2011], Venezuela [Penfold-Becerra, 2007], Argentina [Weitz-Shapiro, 2012], and Egypt [Ahmed and Bouis, 2002]. These policies helped to avoid famine and popular unrest; however, the quality of subsidized food was rather low: cheap calories (carbohydrate-rich products). Authoritarian governments can afford to subsidize basic staple foods (bread, wheat flour or cooking oil) but not Black Angus beef.

With only a few papers on this topic, the relationship between nutritional status and regime type remains unclear. Most authors take the causality link from regime to diet for granted without proper testing. Meanwhile, a historical overview suggests that the improvement of diet preceded not only democracy but also economic growth. The theoretical framework is presented.

The model: A 'European diet' and transition to democracy

A European diet is a protein rich (especially animal protein) sugar and alcohol rich diet. It is a remarkable improvement from poor mono-cereal diets that predominated all societies since their transition to agriculture. The introduction and spread of such a diet is regarded as increasing the nutrition status of all strata in a given society.

As noted above, the historical improvement in diet in the West not only preceded democracy but economic growth also. European societies had higher chances for transition to this diet: rainfall agriculture, lactose tolerance (and an abundance of dairy products), earlier benefits from new geographic discoveries and technological progress. Being pioneers of modernization, Europeans were the first to take advantage of the intercontinental exchange of crops and domesticated animals. The dairy industry was also connected with meat production; lactose tolerant societies had the greatest variety of cattle breeds [Bloom and Sherman, 2005]. Also Europeans were the first who could enhance their nutritional status using technological innovations. The spread of railroads, the use of fossil fuels and the invention of refrigeration made it possible to import food from every point on the planet. A radical decrease in

transportation costs and developments in logistics made many food items affordable to the poorer classes. At first, Europeans could increase their calorie intake per capita, then the amount of protein intake, and finally the amount of the most prestigious and expensive animal proteins. Globalization spread European diet patterns and changes traditional food practices in developing countries [e.g., Pingali 2007].

Anecdotal evidence comes from the case of obesity. 7 of the top 10 most obese countries in the world (BMI 30+, according WHO data) are small island states in the Pacific—Nauru, Samoa, Takelau, Kiribati, Marshall Islands, Federated States of Micronesia and French Polynesia [see Brooks, 2011]. Surprisingly, these societies are likely to have had the healthiest diet in the world—fish, seafood and seaweed. After inclusion in the global economy these societies have exchanged their biological resources for cash and supermarket food. This can be interpreted in terms of modernization: the first thing that Europeans bring with them to other societies is their diet. Changes in diet precede other changes.

Nowadays, globalization, economic growth and the cultural attractiveness of the West are likely to be the main factors of improvement in nutrition across many developing countries. This change in diet leads to the rise of existential security and triggers value change. Within the framework of the revised modernization theory it is regarded as a structural prerequisite for political change. The main argument is that the effect of an increase of nutritional status on political change is independent of economic growth. The hypotheses are:

H1: An improvement in diet has a positive effect on regime change after controlling for income growth and global trade.

H2: An improvement in diet precedes democracy.

Data and methods

Variables

The dependent variable is **democracy** measured by the Freedom House index. Instead of the original scale where "1" – the most free and "7" is the least free I use the reverse scale, where "1" – the least free and "7" – the most free. In one specification this scale is recoded: from "1" to

"3" is democracy ("1") and from "4" to "7" autocracy ("0"). I take this data for years 1992 (the year after the collapse of the USSR), 2002 and 2011.

The control variable is income, which is measured as (log) GDP per capita, PPP (current international US dollars) for 1992, 2002 and 2011. This data is taken from the World Development Indicators database.

Another control variable is Trade as an indicator for trade liberalization, which is measured as (log) sum of exports and imports of goods and services measured as a share of GDP. This data is also taken from the World Development Indicators database.

Data on diet composition is from the FAOSTAT's food balance sheets for 1992, 2002 and 2011.

Calories – food supply, kcal/capita/day;

Proteins – proteins supply quantity, g/capita/day;

Animal proteins – average supply of protein of animal origin (3-year average), g/capita/day;

Animal products, kcal/capita/day;

Vegetal products, kcal/capita/day.

The data is from 157 countries (14 countries had no 1992 GDP data). Descriptive statistics for the main indicators are presented in Table 1. In general, the main tendency is a slow but permanent increase in income, political freedom and nutrition status. However, this data cannot say anything about the causality between these variables.

Table 1. Descriptive statistics for variables

	N	Min.	Max.	Mean	Std. dev.
GDP cap (PPP), 1992	143	240	53739	7166	7956
GDP cap (PPP), 2002	157	483	63217	10539	11736
GDP cap (PPP), 2011	157	733	76309	15728	15634
Freedom House, 1992	155	1	7	3.56	1.90
Freedom House, 2002	157	1	7	3.28	1.86

Freedom House, 2011	157	1	7	3.21	1.84
calories cap/day 1992	157	1506	3710	2581	508
calories cap/day 2002	157	1826	3783	2703	493
calories cap/day 2011	157	1937	3793	2835	443
protein supply g/cap/day 1992	157	30	115	72	20
protein supply g/cap/day 2002	157	34	128	76	21
protein supply g/cap/day 2011	157	38	131	80	20
animal protein supply g/cap/day 1992	157	3	78	31	20
animal protein supply g/cap/day 2002	157	4	94	33	20
animal protein supply g/cap/day 2011	156	5	96	35	20
animal products, % daily calories, 1992	157	0.03	0.48	0.18	0.10
animal products, % daily calories, 2002	157	0.02	0.45	0.18	0.10
animal products, % daily calories, 2011	157	0.03	0.45	0.18	0.09
trade, % of GDP 1992	144	0.02	2.80	0.73	0.44
trade, % of GDP 2002	156	0.21	2.87	0.81	0.41
trade, % of GDP 2011	152	0.24	4.47	0.92	0.48

This data may have some limitations. First, the real amount of consumed food can be lower than reported in the food balance sheets due to food waste or animal feed, and subsistence agriculture could be underreported. However, I believe that this does not significantly distort my data [for an overview of possible bias and responses to them see Blaydes and Kayser, 2011: 893].

The FAOSTAT dataset gives data on selected nutritional components in kcal/capita/day: cereals, starchy roots, sugar and sweeteners, pulses, vegetables, fruits, alcoholic beverages, meat, milk, fish and seafood.

I recalculate all these figures as shares of daily calories intake. These items account for 84.5%, 83.7% and 82.7% of all daily calories intake for the years 1992, 2002 and 2011 respectively. Descriptive statistics on these items are presented in Table S1 (supplemental materials).

Methods

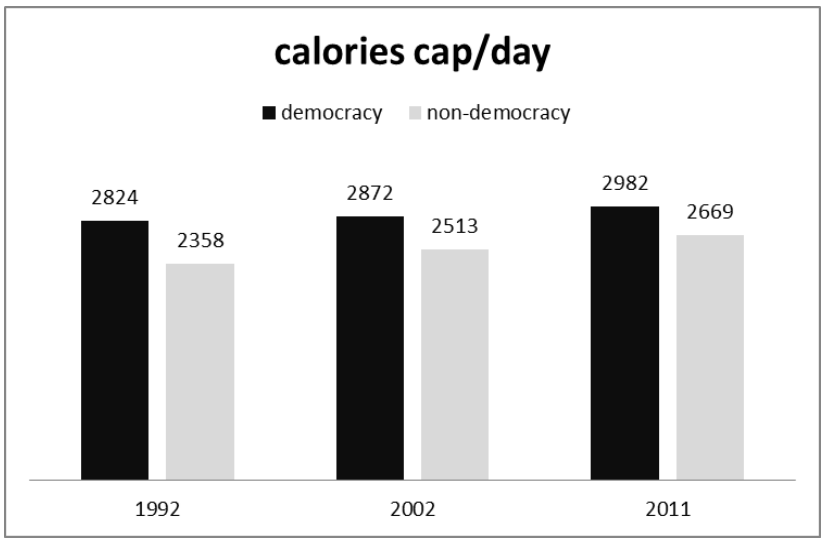
The empirical analysis was done in three steps. First, using T-tests and OLS the basic relationship between diet quality indicators (calories intake, protein and animal protein intake) and regime type were explored. Second, principal component analysis was done to identify 'a European diet' which was an independent variable. Third, to test the hypothesis about the independent effect of diet on regime change, after controlling for income and trade, SEM models were run.

Results

Exploratory analysis

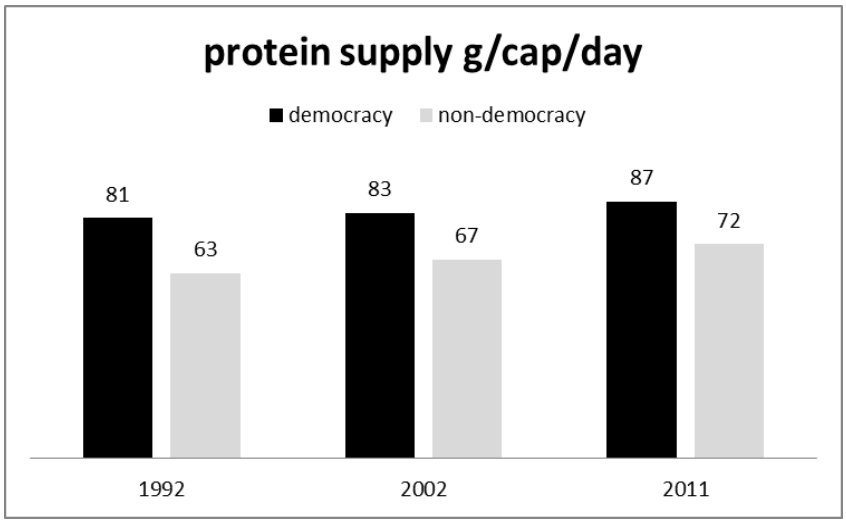
An exploratory analysis was done using descriptive statistics, T-tests and OLS models. Means for calorie intake, protein supply and animal protein supply between them for years 1992, 2002 and 2011 (Figures 1–3) were compared for the dummies democracy and non-democracy. Unsurprisingly, democracies have nutrient-richer diets than non-democracies in all years and for all indicators. Independent sample T-tests show that in all cases the difference between democracies and non-democracies is significant.

Figure 1. Calories per capita, daily intake in 1992, 2002 and 2011



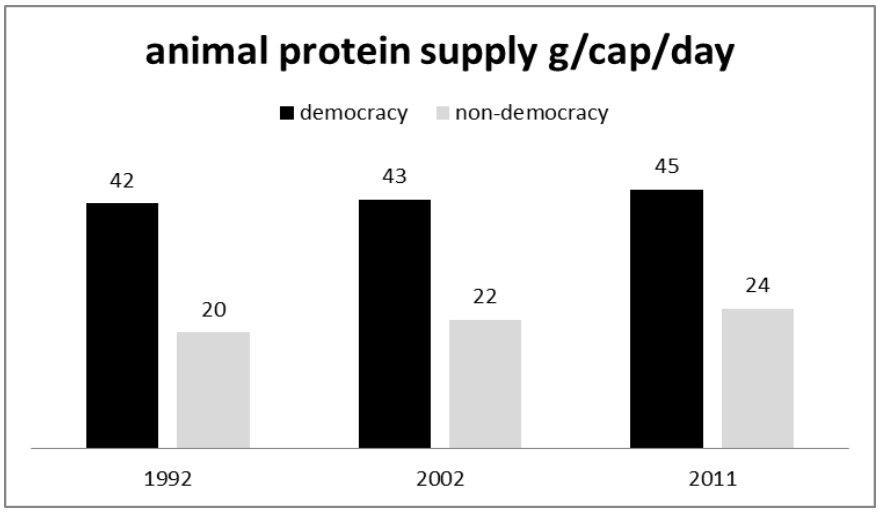
Source: Freedom House, FAOSTAT food balance sheets. For democracies N=75, non-democracies N=80.

Figure 2. Protein supply per capita, daily intake (gr) in 1992, 2002 and 2011



Source: Freedom House, FAOSTAT food balance sheets. For democracies N=83, non-democracies N=74.

Figure 3. Animal protein supply per capita, daily intake in 1992, 2002 and 2011



Source: Freedom House, FAOSTAT food balance sheets. For democracies N=83, non-democracies N=74.

This difference is not so large for daily calorie intake (about 10% in 2011), but for animal protein intake it is very significant (about 45% in 2011). Authoritarian governments are effective in delivering cheap calories to their citizens, but they fail to deliver prestigious foodstuffs. As an example, data on various food items consumption for Netherlands and Saudi Arabia in 2011 is presented (Table 2). This table shows that at the same level of income and calorie daily intake, people in The Netherlands consume two times more animal proteins than people in Saudi Arabia. The Dutch obtain much more calories from prestigious and expensive meat and dairy, but half as much from cheap cereals.

Table 2. Comparison of diet patterns in Netherlands and Saudi Arabia in 2011.

	Income	***Freedom House***	***Calories, cap/day***	***Proteins, g/cap/day***	***Animal proteins, g/cap/day***	***Meat***	***Milk***	***Cereals***
Netherlands	46388	1.0	3147	106	73	11%	14%	22%
Saudi Arabia	49230	7.0	3122	87	34	8%	4.6%	45%

Source: Freedom House, World Development Indicators, FAOSTAT food balance sheets. Income - GDP per capita, PPP, current international dollars; meat, milk and cereals – share of daily calorie intake

OLS models were run to explore the effect of (log) calorie, (log) protein and (log) animal protein intake on political regime (Tables 3 and Table 4).

Table 3. Political regime and diet in 1992, 2002 and 2011

	Standardized Beta-coefficients					
	1992		*2002*		*2011*	
	Model 1	*Model 2*	*Model 3*	*Model 4*	*Model 5*	*Model 6*
Log income	0.243*	-0.231*	0.321**	0.306**	0.333**	0.355**
	(0.184)	(0.187)	(0.176)	(0.180)	(0.169)	(0.181)
Log calories (kcal/capita/days)	0.321**	-	0.209	-	0.174	-
	(1.056)		(1.150)		(1.255)	
Log proteins (g/capita/days)	-	0.332**	-	0.226	-	0.139
		(0.747)		(0.768)		(0.844)
Adjusted R2	*0.271*	*0.273*	*0.243*	*0.245*	*0.219*	*0.213*
N observations	*143*	*143*	*157*	*157*	*157*	*157*

*- significance on 0.05 level, **- significance on 0.01 level. Standard errors are in parentheses.
Source: Freedom House, World Development Indicators, FAOSTAT food balance sheets. DV – Freedom House score.

The models in Table 3 show that although the effects of calorie and protein intake were significant in the early 1990s and even exceeded the effect of income, they lost significance by the early 2000s: income suppresses the effect of calories and proteins on political change. This can be interpreted as meaning that income growth has a dominant role and dietary improvement a subordinate role. Then I run models with (log) animal protein intake.

Table 4. Political regime and animal protein intake in 1992, 2002 and 2011.

	Standardized Beta-coefficients		
	1992	*2002*	*2011*
	Model 7	*Model 8*	*Model 9*
Log income	-0.104	0.000	0.004
	(0.193)	(0.194)	(0.206)
Log animal proteins (g/capita/day)	0.716**	0.573**	0.545**
	(0.302)	(0.319)	(0.364)
Adjusted R2	*0.391*	*0.320*	*0.291*
N observations	*157*	*157*	*157*

*- significance on 0.05 level, **- significance on 0.01 level. Standard errors are in parentheses.
Source: Freedom House, World Development Indicators, FAOSTAT food balance sheets. DV – Freedom House score.

Models 7–9 show different results. In all cases nutritional variables are significant, positive and even have stronger coefficients than income, which is insignificant in all specifications. All models have higher predictive power (min. R^2= 0.291) than any model in Table 3 (max. R^2= 0.273). Animal protein supply has stronger effect on regime change than income. These findings are not conclusive and say nothing about the causality, but encourage further analysis.

Principal component analysis

Table 5 shows the factor analysis (principal component analysis) with ten nutritional components using four principal components as diet types.

Table 5. PCA of nutritional components in 1992, 2002 and 2011

	Rotated matrix of components											
	1992				**2002**				**2011**			
	Component				**Component**				**Component**			
	1	***2***	***3***	***4***	***1***	***2***	***3***	***4***	***1***	***2***	***3***	***4***
Sugar	.595	-.112	.264	.604	.647	-.117	-.079	-.560	.609	-.126	.159	-.586
Fruit	.055	.743	.344	-.048	.042	.733	.020	.085	.086	.712	.237	.167
Vegetables	.256	-.198	.234	-.598	.358	-.277	.117	.682	.398	-.293	.029	.732
Cereals	-.720	-.624	.078	-.019	-.670	-.676	-.048	.016	-.704	-.630	-.042	.024
Meat	.801	-.032	-.200	-.141	.825	.080	.023	.111	.804	.078	-.079	-.015
Fish	.150	.193	-.671	.412	.245	.070	.849	-.302	.257	.194	-.802	-.176
Milk	.801	-.201	.164	.007	.730	-.116	-.363	-.003	.737	-.152	.317	.097
Alcohol beverages	.628	.352	.139	-.175	.632	.342	-.224	.102	.610	.265	.149	.021
Starchy roots	-.346	.718	-.355	-.250	-.467	.707	.154	.211	-.474	.713	-.160	.189
Pulses	-.461	.408	.565	.321	-.527	.367	-.434	-.273	-.576	.235	.500	-.227
Variance extracted, %	*29.73*	*18.79*	*12.31*	*11.12*	*31.65*	*18.60*	*11.38*	*10.19*	*32.15*	*17.07*	*11.32*	*10.36*

Source: FAOSTAT Food Balance sheets

Although the theoretical assumption behind the test is about animal protein-rich items the PCA is preferable to confirmatory factor analysis. First, as it does not exclude substantial nutrition items from the analysis. Our understanding of 'European diet' might be enriched with other elements. Second, the number of variables is reduced while retaining as much of the original variance as possible.

The first factor stresses the significance of meat, milk, alcohol and sugar (with a negative sign for cereals and pulses). Since the highest loadings are found among countries with European culture and the lowest among the poorest African and Asian countries (see Table 6), it was defined as the 'European diet' factor, and the loadings were saved as a separate variable for the years 1992, 2002 and 2011. The European diet is rich in animal proteins (meat and dairy products), sugar and alcohol; the role of cereals and pulses is this diet is rather low. Other factors/diet types stress significance of fruit and starchy roots with lower share of cereals (type 2), pulses (type 3) and vegetables (type 4); however, factors 3 and 4 are inconsistent. For factors

2 and 3 the highest loadings are among poor countries, while for factor 4 it's a mix of low-, mid- and high-income countries (see Table S2 in Supplemental materials).

Table 6. A European diet: top-10 countries with highest factor loadings (component 1) in 1992, 2002 and 2011.

Top-10					
1992		**2002**		**2011**	
Country	***Factor loadings***	***Country***	***Factor loadings***	***Country***	***Factor loadings***
Bahamas	1.890	*Iceland*	2.145	*Iceland*	2.088
Switzerland	1.857	*Netherlands*	1.746	*Bahamas*	1.654
Finland	1.855	*Ireland*	1.690	*Finland*	1.635
Netherlands	1.855	*Switzerland*	1.684	*Switzerland*	1.616
Australia	1.797	*Finland*	1.683	*Netherlands*	1.607
Iceland	1.796	*Bahamas*	1.670	*Antigua and Barbuda*	1.526
France	1.737	*Australia*	1.500	*Hong Kong*	1.454
Estonia	1.667	*Cyprus*	1.478	*Sweden*	1.395
Germany	1.638	*U.S.A.*	1.476	*Estonia*	1.374
Czechoslovakia	1.618	*Antigua and Barbuda*	1.469	*Denmark*	1.371
Bottom-10					
1992		**2002**		**2011**	
Country	***Factor loadings***	***Country***	***Factor loadings***	***Country***	***Factor loadings***
Togo	-1.495	*Madagascar*	-1.572	*Madagascar*	-1.599
Lao PDR	-1.501	*Niger*	-1.651	*Chad*	-1.604
Tanzania	-1.509	*Benin*	-1.706	*Rwanda*	-1.723
Nepal	-1.526	*Tanzania*	-1.720	*Bangladesh*	-1.784
Niger	-1.616	*Togo*	-1.822	*Togo*	-1.796
Benin	-1.636	*Mozambique*	-1.830	*Benin*	-1.832
Mozambique	-1.717	*Malawi*	-1.877	*Mozambique*	-1.950
Malawi	-1.72	*Bangladesh*	-1.886	*Malawi*	-2.033
Bangladesh	-1.86	*Rwanda*	-1.916	*Ethiopia*	-2.139
Ethiopia	-2.003	*Ethiopia*	-1.979	*Niger*	-2.143

Unsurprisingly, the European diet factor strongly correlates with various development indicators like Freedom House score and GDP per capita (ppp), while other diet factors are either insignificant, or weak and inconsistent (see Table S3 in Supplementary materials). Every chosen time indicated an improvement of diet. This factor better captures diet patterns than simply reducing them to calories or even animal proteins.

SEM

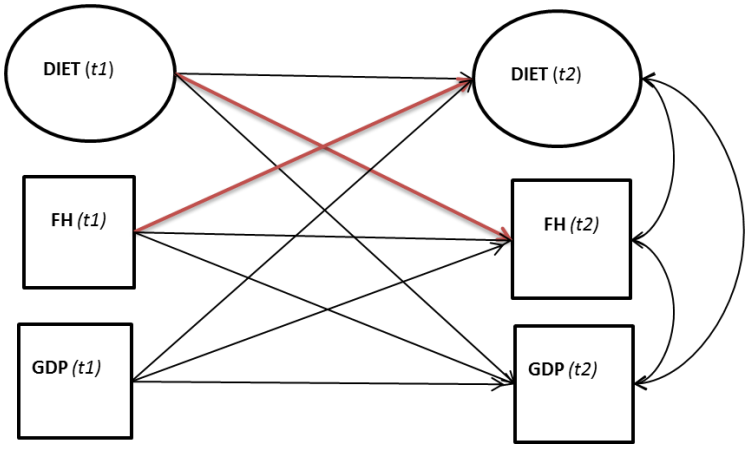
SEM methodology and path-analysis technique are used to test the causal relationship between change in diet and values. All models were run using R software (lavaan package).

This methodological approach allows for the testing of a path-dependency relationship between variables. SEM is an extension of factor analysis and regression analysis, expressing the interrelationship between variables through a set of linear relationships. SEM replaces a set of observable variables with a small set of unobservable constructs [for details, see Joereskog, 1973; Bollen, 1993].

Using SEM has several advantages in this case. Most importantly, SEM allows the testing of causality by doing a path-analysis between diet and democracy, after controlling for income and trade. These three variables—democracy score, European diet and income/trade—at two time points (t_1 and t_2) test the relationship between diet and democracy. This approach enables a comparison of the strength of the coefficients diet-on-democracy and democracy-on-diet. Three models: from 1992 to 2011, from 1992 to 2002 and from 2002 to 2011 are run for data for three time points (1992, 2002 and 2011). Multicollinearity between independent variables, can create problems using OLS, but not in SEM. Although OLS and SEM are both methods that are based on linear statistical models, the latter is highly flexible. In the SEM model specification, the researcher is required to specify relations a priori and have a strong theory behind the hypotheses. Another advantage is visualization: SEMs may be presented as graphical path diagrams and then transformed into a set of equations. This is a powerful way to present complex relationships in SEM. Moreover, instead of straightforward significance tests SEM examines multiple tests to evaluate model fit. Therefore, there is a strong preference for SEM compared to OLS.

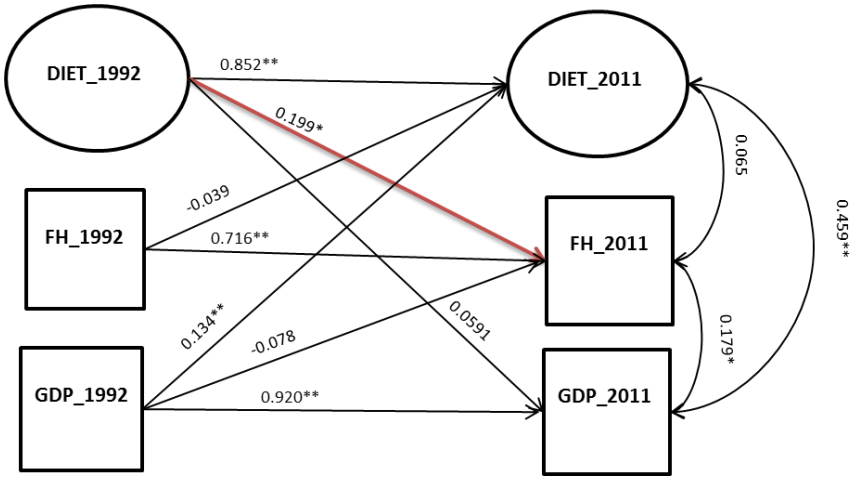
The dependent variables are Freedom House 2011 (2002), GDP/TRADE 2011 (2002) and DIET 2011 (2002), independent variables are Freedom House 1992 (2002), GDP/TRADE 1992 (2002) and DIET 1992 (2002). The effect of diet on regime and regime on diet is tested, controlling for income/trade. A visual outline of my model is presented below (Fig.4).

Figure 4. Outline of the model



For the identification of all models, one relationship (the weakest one and the least theoretically significant) between variables was fixed to 0. All equations can be found in Supplemental materials (Appendix 2). Figure 5 shows Model 1 which explores the relationship between diet and democracy from 1992 to 2011.

Figure 5. Model 1: Democracy, income and diet in 1992-2011

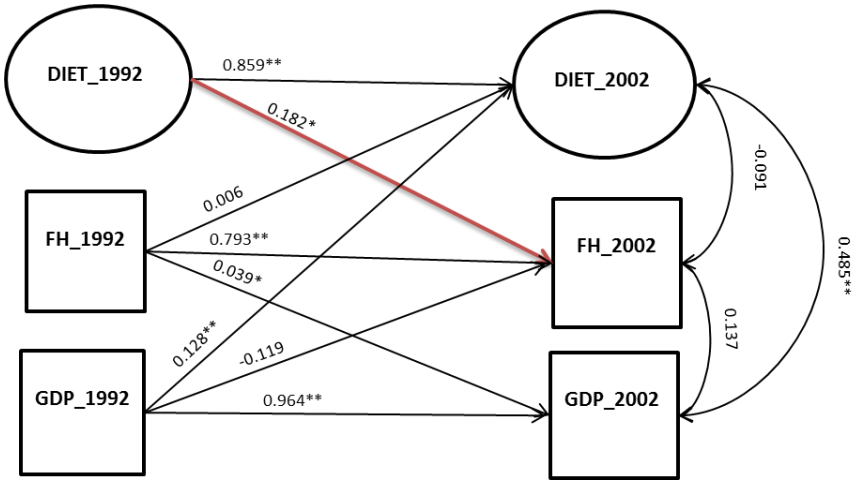


χ^2 = 0.415, df = 1, p = 0.519, CFI = 1.000, RMSEA = 0.000, SRMR = 0.004. N = 142

*** - significance on 0.01 level; * - significance on 0.05 level. Standardized coefficients are presented. For unstandardized coefficients see Supplemental materials, Appendix 2.2.*

Model 1 shows that diet has an effect on democracy, independent from income. While the effect of democracy on diet is insignificant, the effect of diet is significant and has the predicted sign (0.199). An increase in income also has a positive effect on diet (0.134), but it is weaker compared to that of diet.

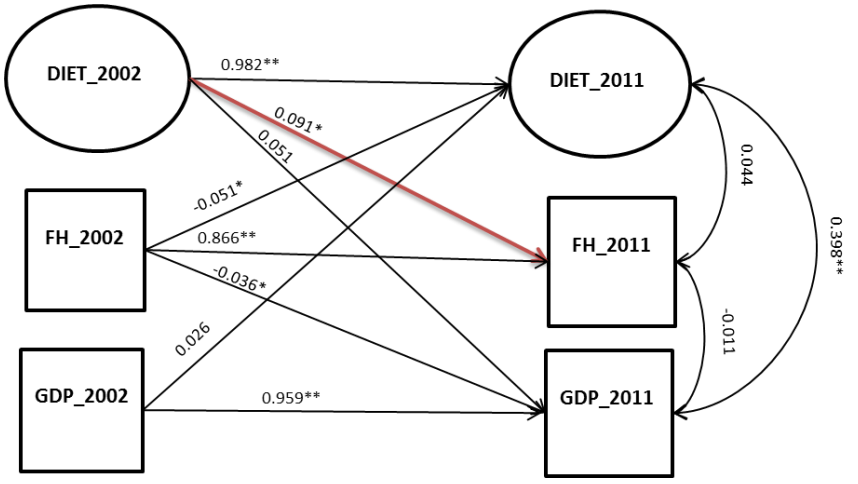
Figure 6. Model 2: Democracy, income and diet in 1992-2002



χ^2 = 0.013, df = 1, p = 0.910, CFI = 1.000, RMSEA = 0.000, SRMR = 0.000. N = 142
*** - significance on 0.01 level; * - significance on 0.05 level. Standardized coefficients are presented*
For unstandardized coefficients see Supplemental materials, Appendix 2.2.

In Model 2 (Figure 6) all links between variables remained similar to the previous model with diet affecting regime (0.182), but not vice versa (0.006; ns); the sign is again as predicted. Change in income has a lower effect (0.128) than that of an improvement in diet.

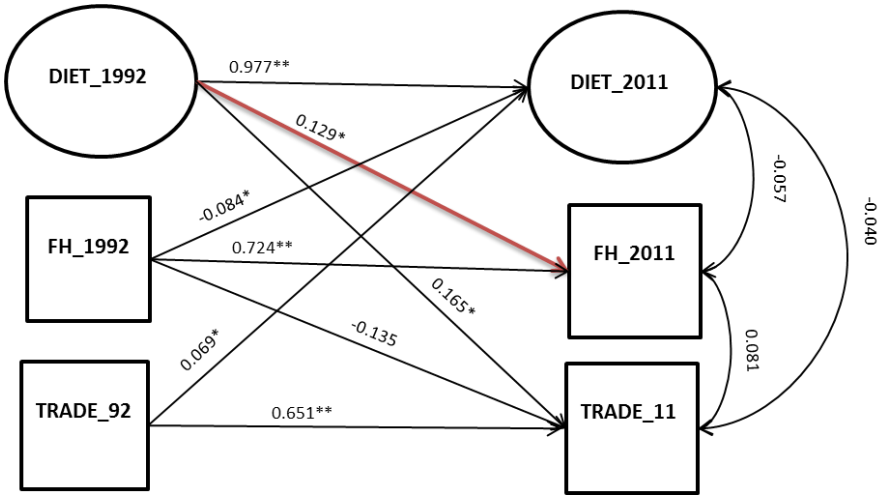
Figure 7. Model 3: Democracy, income and diet in 2002-2011



χ^2 = 0.291, df = 1, p = 0.590, CFI = 1.000, RMSEA = 0.000, SRMR = 0.003. N = 157
*** - significance on 0.01 level; * - significance on 0.05 level. Standardized coefficients are presented*
For unstandardized coefficients see Supplemental materials, Appendix 2.2.

Model 3 (Figure 7) tests the effects between 2002 and 2011 and provides support for the results. Both links are significant (diet-to-democracy and democracy-to-diet); however, the coefficient of the effect of diet on democracy is stronger (0.091 vs. -0.051). Moreover, the effect of democracy on diet has the opposite sign: it is negative relationship between democracy and diet showing that the effect of an improvement in diet is stronger and theoretically more plausible.

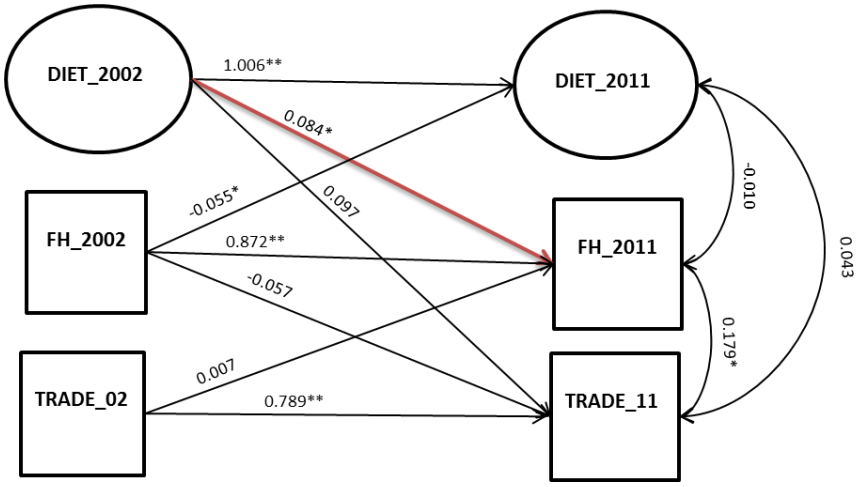
Figure 8. Model 4. Democracy, trade and diet in 1992-2011.



χ^2 = 0.416, df = 1, p = 0.519, CFI = 1.000, RMSEA = 0.000, SRMR = 0.008. N = 138
*** - significance on 0.01 level; * - significance on 0.05 level. Standardized coefficients are presented*
For unstandardized coefficients see Supplemental materials, Appendix 2.2.

Models 4–5 include Trade as a control variable instead of Income and show similar results. Although these models reveal the mutual effects of the tested variables, diet has the strongest effect in these specifications. In Model 4 (Figure 8) Diet has the predicted and a stronger impact on democracy (0.129) than democracy on diet (-0.084). Moreover, democracy has counterintuitive negative sign: less democracy is associated with improvement in diet. Unsurprisingly, trade has significant positive effect on diet (0.069), but the effect of diet overweighs it (0.165).

Figure 9. Model 5. Democracy, trade and diet in 2002-2011.



χ^2 = 0.008, df = 1, p = 0.928, CFI = 1.000, RMSEA = 0.000, SRMR = 0.000. N = 151
*** - significance on 0.01 level; * - significance on 0.05 level. Standardized coefficients are presented*
For unstandardized coefficients see Supplemental materials, Appendix 2.2.

Model 5 (Figure 9) reveals the stronger effect of diet on democracy (0.084) than the one of democracy on diet (-0.055). The latter is negative again. The model for democracy, trade and diet in 2002–2011 has no significant links between tested variables and is omitted from our analysis.

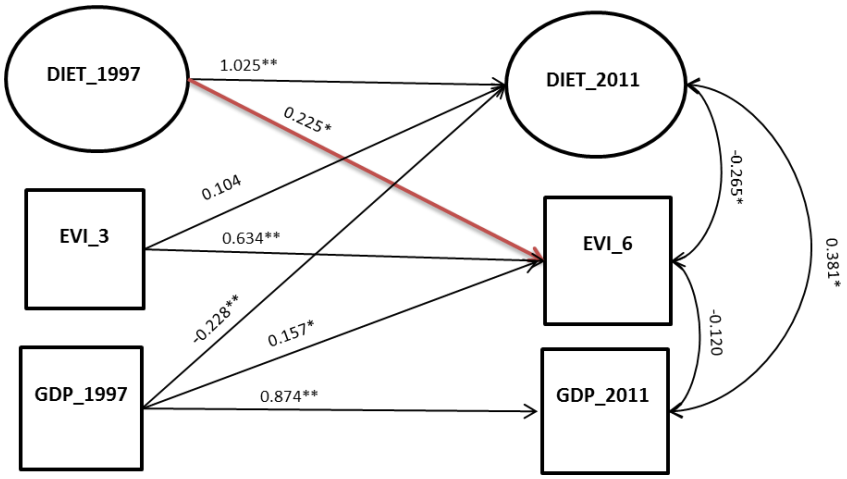
To sum up, in 5 of the 6 models (including the omitted one) diet has consistent positive effect on democracy; in one model it is insignificant. Democracy has a significant but negative effect on an improvement in diet in 2 of the 6 models; in 4 models the effect is insignificant. These tests allow me to conclude that an improvement in diet—understood as an increased share of animal proteins has an independent, strong and positive effect on the political regime. It means that it is possible to consider diet not only as a function of income or the liberalization of trade but also as a separate, important factor. In all the tested models the effect of income on diet is either weaker, or insignificant. An improvement in diet precedes democracy and is independent from income and trade effects. Thus, both hypotheses are confirmed.

Robustness check

A robustness check is also carried out: the dependent variable, sample size and time point are changed. My alternative dependent variable is the Emancipative Values Index. Emancipative

values are a multi-point index from minimum 0 to maximum 1.0 based on twelve items from the World Values Survey. On the conceptual level, emancipative values hold a life free from external domination to be important and these values emphasize equal freedoms for everyone. Emancipative values involve a double emphasis on the freedom of choice and the equality of opportunities [for more details, see Welzel, 2013]. This index emphasizes value change from traditional to post-industrial societies, and is highly correlated to all indicators of development—the Human Development index, the Freedom House score, GDP per capita etc. Wave 3 (EVI3) and wave 6 (EVI6) correspond to the years 1997 and 2011 respectively, and the available data are for 50 countries.

Figure 10. Model 6. Emancipative Values and diet in 1997-2011



χ^2 = 0.098, df = 1, p = 0.755, CFI = 1.000, RMSEA = 0.000, SRMR = 0.002. N = 50
*** - significance on 0.01 level; * - significance on 0.05 level. Standardized coefficients are presented*
For unstandardized coefficients see Supplemental materials, Appendix 2.2.

Model 6 (Figure 10) shows that an improvement in diet has a significant and positive effect on values (0.225), but not vice versa (0.104; ns). The effects of income on values (0.157) is weaker; and the effect of income on diet (-0.228) is negative. This shows that an improvement in diet precedes value change and the effect of diet is likely to exceed the effect of income. To sum up, improvement in diet is an essential prerequisite for value shift and political change.

Discussion and conclusion

What is "the recipe" of democracy? The findings show that a more nutrient-rich diet—in terms of higher share of animal proteins—increases the chances of regime change. It is argued that a transition to democracy is unlikely without a dramatic increase in the consumption of animal proteins. Globalization, the spread of the Western lifestyles and economic growth lead to dramatic changes in diet across the globe. Local supermarkets become instruments promoting structural changes: they introduce populations to new foodstuffs, diet habits and lifestyles. How can one explain the relationship between an improvement in diet and regime change? Below several causal mechanisms are presented; they are not tested empirically, but they are consistent with the literature. I suggest four potential effects that can explain this relationship.

The first is *a social-psychological effect*: permanent access to prestigious items like meat and dairy products contributes to the feeling of existential security which is important for a value shift from survival to self-expression values [Norris and Inglehart, 2004]. When people gain permanent access to prestigious and nutritious foodstuffs, they realize that the threat of famine is gone; this is likely to become one of triggers of a shift in values. Self-expression values are strongly associated with the support for democracy [Inglehart and Welzel, 2005]. Historically, an animal-protein rich diet was the privilege of the rich [Koepke and Baten, 2008] and the spread of a new diet demolishes one of the most powerful hierarchies in society. Food abundance but not monetary income is significant for existential security for many people. For example, many societies have a tradition of praying before every meal (thanking god for 'daily bread') but they unlikely to have a tradition of praying before payday.

The second is *a social-political effect*. Food autonomy is likely to increase political autonomy. The distribution of food is one of the powerful foundations of patronage and clientelist networks in developing countries [e.g., Hendrix and Haggard, 2015; Penfold-Becerra, 2007; Ansell and Mitchell, 2011]. Political leaders exchange either subsidies on basic foods, or distribute cheap food sets for the votes of the poor. However, those people who can afford any item in a supermarket are effectively excluded from these networks. An improvement in diet gives people the chance to escape from vertical, hierarchical political structures.

The third is *a health effect*. Higher nutritional status is associated with higher health status; this is especially important for pregnancy and infancy. A good diet in terms of calorie intake and the share of animal-protein rich foods plays a crucial role in the formation of vital

organs, including the central nervous system, which is responsible for cognitive capacities. Well-nourished children with normal cognitive development are better exposed to education. Poverty and malnutrition have a significant negative effect on children's educational performance [Fogel, 1997; Farah et al., 2006; Heckman, 2006]. The fact that education is a crucial factor in the transition to democracy is common-place in the literature [e.g., Glaeser, Ponzetto and Shleifer, 2007; Castello-Clement, 2008]. Educational attainment is associated with pro-democratic attitudes, tolerance to diversity, and political engagement. Primary schooling precedes transition to democracy [Uslaner and Rothstein, 2016].

The fourth is *a social-biological effect*. An animal-protein rich diet is what humans always wanted and still want. In other words, it is a dramatic change from a macrohistorical perspective. Primitive societies of hunter-gatherers enjoyed balanced diet which included both vegetal and animal products. Early humans were taller and had better health in terms of life expectancy and exposure to infectious diseases [see Brooks, 2011]. Over dozens of millennia the human body adapted to such a diet. The transition to sedentary agriculture and the rise of agrarian empires forced an absolute majority of people to poor monocereal diets. Some scholars even argue that this transition was 'the worst mistake in human history' [Standage, 2009]. Only modernization and human emancipation allowed people to 'return' to an animal-protein rich diet. Perhaps, the abundance of meat and dairy products is the best advocate for a Western lifestyle compared to many other things like capitalism and political freedoms. That is what people as biological organisms really want.

The main conclusion is the argument that a high nutritional status is *a universal feature of the middle class*. No matter what the relative income is, access to a good diet can be a defining feature of this social class. Animal proteins are more expensive than carbohydrates and non-animal proteins; consumption of certain meats and cheeses may also be regarded as a kind of symbolic consumption which is associated with a middle class lifestyle. Returning to the quotation from John Locke, I would argue that nourishment and education are indeed linked together as universal predictors of the middle class.

The findings also have important practical implications. First, it is good evidence that nutritional indicators (calorie intake, protein supply or the European diet Index) can be used as a proxy of material well-being. This data is available on an aggregate level but further research is required to test the effect on the individual level through surveys and, perhaps, lab or field experiments. Second, these findings could be of crucial importance for policy-makers. If an

improvement in diet is required for establishing democracy, at least, in some cases, humanitarian aid might be preferable to financial aid. In fact, the import of animal-protein rich food must precede the import of political institutions.

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Supplemental materials

Appendix 1

Table S1. Descriptive statistics on aggregate food items (1992, 2002 and 2011).

	N	Min.	Max.	Mean	Std. dev.
Sugar 1992	157	.01	.25	.01	.05
Sugar 2002	157	.01	.22	.10	.05
Sugar 2011	157	.02	.21	.10	.04
Fruit 1992	157	.00	.20	.04	.03
Fruit 2002	157	.00	.20	.04	.03
Fruit 2011	157	.00	.18	.04	.03
Vegetables 1992	157	.00	.06	.02	.01
Vegetables 2002	157	.00	.06	.02	.01
Vegetables 2011	157	.00	.07	.02	.01
Cereals 1992	157	.16	.83	.44	.16
Cereals 2002	157	.14	.83	.42	.15
Cereals 2011	157	.18	.77	.41	.13
Meat 1992	157	.01	.32	.07	.05
Meat 2002	157	.01	.19	.07	.04
Meat 2011	157	.01	.23	.08	.04
Fish 1992	157	.00	.12	.01	.01
Fish 2002	157	.00	.15	.01	.02
Fish 2011	157	.00	.13	.01	.01
Milk 1992	157	.00	.19	.06	.04
Milk 2002	157	.00	.17	.06	.04
Milk 2011	157	.00	.17	.06	.04
Alcohol beverages 1992	157	.00	.09	.03	.02
Alcohol beverages 2002	157	.00	.10	.03	.02
Alcohol beverages 2011	157	.00	.10	.03	.02
Starchy roots 1992	157	.00	.43	.07	.09
Starchy roots 2002	157	.00	.45	.07	.09
Starchy roots 2011	157	.01	.40	.07	.08
Pulses 1992	157	.00	.13	0.02	.02
Pulses 2002	157	.00	.13	0.02	.02
Pulses 2011	157	.00	.13	0.02	.02

Source: FAOSTAT food balance sheets. All figures are shares of daily calorie intake

Table S2. Factor loadings for components 2, 3 and 4.

1992

Country	Factor loading 2	Country	Factor loading 3	Country	Factor loading 4
Rwanda	5.565	*Rwanda*	3.201	*Maldives*	4.689
Uganda	4.789	*Uganda*	2.038	*Cuba*	2.160
Gabon	2.771	*Lebanon*	1.984	*Nicaragua*	2.068
Ghana	2.600	*Nicaragua*	1.828	*Colombia*	1.983
Congo	2.203	*Haiti*	1.771	*Iceland*	1.772
Central African Republic	2.126	*Guatemala*	1.658	*Guatemala*	1.701
Solomon Islands	2.078	*Cuba*	1.655	*Grenada*	1.667
Cameroon	1.743	*Costa Rica*	1.484	*Costa Rica*	1.658
Cote d'Ivoire	1.704	*Dominican Rep.*	1.444	*Trinidad-Tobago*	1.608

2002

Country	Factor loading 2	Country	Factor loading 3	Country	Factor loading 4
Rwanda	5.558	*Maldives*	7.051	*China*	3.597
Uganda	4.632	*Kiribati*	2.523	*Guinea*	2.187
Ghana	3.023	*Japan*	2.518	*Lao PDR*	2.182
Gabon	2.113	*Samoa*	2.462	*Hong Kong*	2.085
Central African Republic	1.916	*Ghana*	2.083	*Uzbekistan*	1.838
Cote d'Ivoire	1.797	*Hong Kong*	1.915	*Greece*	1.698
Congo	1.762	*Malaysia*	1.760	*S. Korea*	1.635
Solomon Islands	1.582	*Vanuatu*	1.719	*Bosnia*	1.588
Mozambique	1.570	*Solomon Islands*	1.717	*Kyrgyzstan*	1.497
Cameroon	1.548	*Cambodia*	1.409	*Lebanon*	1.492

2011

Country	Factor loading 2	Country	Factor loading 3	Country	Factor loading 4
Rwanda	5.111	*Rwanda*	3.005	*China*	3.821
Uganda	3.660	*Niger*	1.992	*Uzbekistan*	3.221
Ghana	3.550	*Sudan (former)*	1.498	*Albania*	2.838
Gabon	2.305	*Kenya*	1.407	*Armenia*	2.359
Congo	2.256	*Haiti*	1.398	*Kazakhst.*	1.945
Central African Republic	2.119	*Albania*	1.363	*Bosnia*	1.921
Cote d'Ivoire	2.014	*Guatemala*	1.351	*S. Korea*	1.805
Solomon Islands	1.961	*Nicaragua*	1.343	*Tajikistan*	1.772
Samoa	1.877	*Cuba*	1.340	*Iran*	1.705
Cameroon	1.726	*Uganda*	1.308	*Romania*	1.615

Table S3. Correlation between diet factors (PCA components) and development indicators (GDP per capita and Freedom House score)

		1992			
		Component 1	**Component 2**	**Component 3**	**Component 4**
GDP per capita (PPP), 1992	*Pearson's correlation*	.650**	.000	-.035	-.040
	Sig. (2-tailed)	.000	.999	.682	.633
	N	*143*	*143*	*143*	*143*
Freedom House 1992	*Pearson's correlation*	-.637**	-.103	.098	-.165*
	Sig. (2-tailed)	.000	.203	.223	.040
	N	*155*	*155*	*155*	*155*
		2002			
		Component 1	**Component 2**	**Component 3**	**Component 4**
GDP per capita (PPP), 2002	*Pearson's correlation*	.667**	.030	.056	.092
	Sig. (2-tailed)	.000	.712	.489	.254
	N	157	157	157	157
Freedom House, 2002	*Pearson's correlation*	-.577**	-.145	.066	.186*
	Sig. (2-tailed)	.000	.071	.410	.020
	N	*157*	*157*	*157*	*157*
		2011			
		Component 1	**Component 2**	**Component 3**	**Component 4**
GDP cap, ppp 2011	*Pearson's correlation*	.680**	.012	-.032	-.006
	Sig. (2-tailed)	.000	.883	.689	.941
	N	*157*	*157*	*157*	*157*
Freedom House 2011	*Pearson's correlation*	-.550**	-.170*	.038	.212**
	Sig. (2-tailed)	.000	.033	.641	.008
	N	*157*	*157*	*157*	*157*

*** - significance on 0.01 level; * - significance on 0.05 level.*

Appendix 2

2.1. Equations for SEM models

All equations are run simultaneously.

Model 1

$DIET2011 = \alpha_1 + \beta_{11}GDP1992 + \beta_{12}FH1992 + \beta_{13}DIET1992 + \varepsilon_1$
$FH2011 = \alpha_2 + \beta_{21}\ GDP1992 + \beta_{22}FH1992 + \beta_{23}DIET1992 + \varepsilon_2$
$GDP2011 = \alpha_3 + \beta_{31}GDP1992 + \beta_{32}DIET1992 + \varepsilon_3$

Model 2

$DIET2002 = \alpha_1 + \beta_{11}GDP1992 + \beta_{12}FH1992 + \beta_{13}DIET1992 + \varepsilon_1$
$FH2002 = \alpha_2 + \beta_{21}\ GDP1992 + \beta_{22}FH1992 + \beta_{23}DIET1992 + \varepsilon_2$
$GDP2002 = \alpha_3 + \beta_{31}GDP1992 + \beta_{32}DIET1992 + \varepsilon_3$

Model 3

$DIET2011 = \alpha_1 + \beta_{11}GDP2002 + \beta_{12}FH2002 + \beta_{13}DIET2002 + \varepsilon_1$
$FH2011 = \alpha_2 + \beta_{21}FH2002 + \beta_{23}DIET2002 + \varepsilon_2$
$GDP2011 = \alpha_3 + \beta_{31}GDP2002 + \beta_{32}DIET2002 + \beta_{33}FH2002 + \varepsilon_3$

Model 4

$DIET2011 = \alpha_1 + \beta_{11}TRADE1992 + \beta_{12}FH1992 + \beta_{13}DIET1992 + \varepsilon_1$
$FH2011 = \alpha_2 + \beta_{21}FH1992 + \beta_{22}DIET1992 + \varepsilon_2$
$TRADE2011 = \alpha_3 + \beta_{31}TRADE1992 + \beta_{32}DIET1992 + \beta_{33}FH1992 + \varepsilon_3$

Model 5

$DIET2011 = \alpha_1 + \beta_{11}FH2002 + \beta_{12}DIET2002 + \varepsilon_1$
$FH2011 = \alpha_2 + \beta_{21}FH2002 + + \beta_{22}TRADE2002 + \beta_{23}DIET2002 + \varepsilon_2$
$TRADE2011 = \alpha_3 + \beta_{31}TRADE2002 + \beta_{32}DIET2002 + \beta_{33}FH2002 + \varepsilon_3$

Model 6

$DIET2011 = \alpha_1 + \beta_{11}GDP1997 + \beta_{12}EVI3 + \beta_{13}DIET1997 + \varepsilon_1$
$EVI6 = \alpha_2 + \beta_{21}EVI3 + \beta_{23}DIET1997 + \beta_{31}GDP1997 + \varepsilon_2$
$GDP2011 = \alpha_3 + \beta_{31}GDP2002 + \beta_{32}DIET2002 + \varepsilon_3$

where

DIET – 'European diet' factor loading for respective year
FH – Freedom House score for respective year
GDP – (log) GDP per capita, PPP, current international dollars, for respective year
TRADE – (log) the sum of exports and imports of goods and services measured as a share of GDP
EVI – Emancipative Values Index for World Values Survey waves 3 and 6 respectively

2.2. Output summary for SEM models

Model 1

```
                   Estimate  Std.Err  Z-value  P(>|z|)   Std.lv  Std.all
  eudiet11 ~
    fh92             -0.021    0.017   -1.234    0.217   -0.021   -0.039
    eudiet92          0.852    0.052   16.415    0.000    0.852    0.858
    gdp92             0.117    0.041    2.863    0.004    0.117    0.134
  fh11 ~
    gdp92            -0.127    0.137   -0.924    0.355   -0.127   -0.078
    fh92              0.708    0.062   11.372    0.000    0.708    0.716
    eudiet92          0.370    0.178    2.077    0.038    0.370    0.199
  gdp11 ~
    eudiet92          0.059    0.046    1.295    0.195    0.059    0.051
    gdp92             0.930    0.040   23.290    0.000    0.930    0.920

Covariances:
                   Estimate  Std.Err  Z-value  P(>|z|)   Std.lv  Std.all
  eudiet11 ~~
    fh11             -0.023    0.029   -0.778    0.437   -0.023   -0.065
    gdp11             0.047    0.009    4.971    0.000    0.047    0.459
  fh11 ~~
    gdp11             0.061    0.029    2.094    0.036    0.061    0.179
```

Model 2

```
                   Estimate  Std.Err  Z-value  P(>|z|)   Std.lv  Std.all
  eudiet11 ~
    fh02             -0.028    0.012   -2.392    0.017   -0.028   -0.051
    eudiet02          0.982    0.035   28.449    0.000    0.982    0.982
    gdp02             0.022    0.027    0.809    0.419    0.022    0.026
  fh11 ~
    fh02              0.857    0.038   22.790    0.000    0.857    0.866
    eudiet02          0.168    0.070    2.409    0.016    0.168    0.091
  gdp11 ~
    fh02             -0.023    0.011   -2.126    0.034   -0.023   -0.036
    eudiet02          0.060    0.032    1.858    0.063    0.060    0.051
    gdp02             0.944    0.025   37.456    0.000    0.944    0.959

Covariances:
                   Estimate  Std.Err  Z-value  P(>|z|)   Std.lv  Std.all
  eudiet11 ~~
    fh11              0.007    0.012    0.545    0.586    0.007    0.044
    gdp11             0.018    0.004    4.629    0.000    0.018    0.398
  fh11 ~~
    gdp11            -0.002    0.012   -0.144    0.886   -0.002   -0.011
```

Model 3

```
Estimate  Std.Err  Z-value  P(>|z|)   Std.lv  Std.all
  eudiet02 ~
    fh92              0.003    0.014    0.246    0.806    0.003    0.006
    eudiet92          0.863    0.035   24.532    0.000    0.863    0.859
    gdp92             0.112    0.029    3.897    0.000    0.112    0.128
  fh02 ~
    fh92              0.781    0.056   14.006    0.000    0.781    0.793
    eudiet92          0.336    0.156    2.154    0.031    0.336    0.182
    gdp92            -0.192    0.120   -1.598    0.110   -0.192   -0.119
  gdp02 ~
```

```
    fh92              0.024    0.011    2.219    0.026    0.024    0.039
    gdp92             0.996    0.018   54.950    0.000    0.996    0.964

Covariances:
                   Estimate  Std.Err  Z-value  P(>|z|)   Std.lv  Std.all
  eudiet02 ~~
    fh02             -0.021    0.020   -1.076    0.282   -0.021   -0.091
    gdp02             0.025    0.005    5.201    0.000    0.025    0.485
  fh02 ~~
    gdp02             0.028    0.017    1.616    0.106    0.028    0.137
```

Model 4

```
                   Estimate  Std.Err  Z-value  P(>|z|)   Std.lv  Std.all
  eudiet11 ~
    fh92             -0.043    0.019   -2.277    0.023   -0.043   -0.084
    eudiet92          0.965    0.037   26.248    0.000    0.965    0.977
    Trade92           0.108    0.046    2.366    0.018    0.108    0.069
  fh11 ~
    fh92              0.701    0.062   11.228    0.000    0.701    0.724
    eudiet92          0.239    0.120    1.994    0.046    0.239    0.129
  Trade11 ~
    fh92             -0.031    0.019   -1.656    0.098   -0.031   -0.135
    eudiet92          0.074    0.037    2.004    0.045    0.074    0.165
    Trade92           0.464    0.046   10.163    0.000    0.464    0.651

Covariances:
                   Estimate  Std.Err  Z-value  P(>|z|)   Std.lv  Std.all
  eudiet11 ~~
    fh11             -0.020    0.030   -0.667    0.505   -0.020   -0.057
    Trade11          -0.004    0.009   -0.473    0.636   -0.004   -0.040
  fh11 ~~
    Trade11           0.028    0.030    0.948    0.343    0.028    0.081
```

Model 5

```
Estimate  Std.Err  Z-value  P(>|z|)   Std.lv  Std.all
  eudiet11 ~
    fh02             -0.029    0.011   -2.541    0.011   -0.029   -0.055
    eudiet02          1.000    0.022   46.325    0.000    1.000    1.006
  fh11 ~
    fh02              0.853    0.037   22.860    0.000    0.853    0.872
    eudiet02          0.154    0.072    2.147    0.032    0.154    0.084
    Trade02           0.026    0.121    0.213    0.832    0.026    0.007
  Trade11 ~
    fh02             -0.014    0.014   -0.974    0.330   -0.014   -0.057
    eudiet02          0.044    0.027    1.618    0.106    0.044    0.097
    Trade02           0.724    0.045   16.029    0.000    0.724    0.789

Covariances:
                   Estimate  Std.Err  Z-value  P(>|z|)   Std.lv  Std.all
  eudiet11 ~~
    fh11             -0.002    0.012   -0.126    0.900   -0.002   -0.010
    Trade11           0.002    0.005    0.532    0.595    0.002    0.043
  fh11 ~~
    Trade11           0.033    0.015    2.159    0.031    0.033    0.179
```

Model 6

```
Regressions:
                Estimate  Std.Err  Z-value  P(>|z|)   Std.lv  Std.all
  diet11 ~
```

```
    gdp97            -0.246    0.080   -3.092    0.002   -0.246   -0.228
    evi3              0.985    0.747    1.320    0.187    0.985    0.104
    diet97            1.018    0.083   12.324    0.000    1.018    1.025
  evi6 ~
    diet97            0.026    0.009    2.934    0.003    0.026    0.225
    evi3              0.704    0.085    8.313    0.000    0.704    0.634
    gdp97             0.020    0.008    2.337    0.019    0.020    0.157
  gdp11 ~
    diet97            0.064    0.064    0.994    0.320    0.064    0.077
    gdp97             0.783    0.070   11.258    0.000    0.783    0.874

Covariances:
                   Estimate  Std.Err  Z-value  P(>|z|)   Std.lv  Std.all
  diet11 ~~
    evi6             -0.003    0.002   -1.814    0.070   -0.003   -0.265
    gdp11             0.034    0.014    2.517    0.012    0.034    0.381
  evi6 ~~
    gdp11            -0.001    0.001   -0.841    0.400   -0.001   -0.120
```

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