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Non-Separable Time Preferences and Novelty Consumption: Theory and Evidence from the East German Transition to Capitalism*

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Abstract

Non-separable intertemporal preferences and novelty consumption can explain the persistent correlation between economic development and obesity. Employing the German reunification as a fast motion natural experiment of economic development, we study how the sudden availability of novel food products impacts individual consumption patterns and body weight. Immediately after the reunification, East Germans consumed more novel western food and gained more weight than West Germans. The subsequent long-run persistence in food consumption and body weight among Eastern Germans cannot be explained by taste for variety; it provides evidence for habit formation in intertemporal consumption preferences.

JEL Classification: D11; D12; D92; E21; I12; I15; L66; O10; O33; Q18; R22

Keywords: economic development; food consumption; German reunification; habit formation; learning, novel goods; obesity

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1 Introduction

> "Even though the GDR [...] was for the most part self-sufficient concerning production of food and consumer goods, the choice of items available to the average consumer was limited. It is a well-known fact that some of the first items East Germans bought [...] were bananas and other exotic fruits, which had not been available to them in the GDR" (Ganter, 2008, p.81).

Obesity rates have been rapidly increasing in all industrialized countries over the last decades (Sassi, 2010; World Health Organization, 2015, see Figure A1). The health risks associated with this trend are significant: Obese people are more likely to suffer from diseases such as high blood cholesterol and hypertension (Surwit et al., 1988; Appel et al., 1997; National Heart, Lung, and Blood Institute, 1998; Mohn et al., 2005; Buettner et al., 2007). Moreover, body fat releases hormones such as resistin and leptin that cause type II diabetes and cardiovascular diseases (Trayhurn and Beattie, 2001; Kahn et al., 2009). In general, obesity implies high health care costs, a reduced life expectancy as well as non-health related undesired consequences, such as lower labor market productivity and worse social outcomes (Fontaine et al., 2003; Cawley, 2004; Cawley et al., 2007; Puhl and Heuer, 2009; Cawley and Meyerhoefer, 2012). Consequently, the fight against the obesity 'epidemic' is in the focus of public policy (Griffith and O'Connell, 2010).

One explanation proposed in the literature suggests that economic development has been playing a significant role in the high obesity trend in industrialized countries (Figure A1). To empirically test this hypothesis, the ideal experiment would require exogenous variation in economic development at a specific point in time. However, such an ideal scenario is typically not available because economic development involves multiple factors which asynchronously change over long time horizons. A notable exception is the German reunification, which we exploit in this paper to shed light on the relationship between the availability of new food products, food consumption and body weight.

Our basic hypothesis is that past consumption experiences persistently affect current food consumption patterns. We formally present this hypothesis through a demand-driven model where consumers have a taste for variety and non-separable intertemporal preferences. The latter assumption implies that past consumption experiences can affect current consumption choices, which may occur in two ways. Under habit formation, the marginal utility of consumption decreases with past consumption experiences, whereas under taste formation the marginal utility of consumption increases with experience. When testing our theoretical model, exploiting the German real-world setting, we distinguish between two categories of food. *Novel Food* defines food that the East Germans could not consume before the reunification—either because of trade barriers or because of extremely high prices of western goods on

the East German black market. This category includes both newly developed and engineered food, such as processed or convenience food, but also exotic high quality food (formerly luxury goods), such as exotic fruits. The main point is that East Germans had virtually no previous consumption experience with such novel food when it suddenly became available after the reunification. Rather, they were used to consuming *Familiar Food*, such as potatoes, meat and eggs, which had always been available in both parts of Germany.

The empirical application focuses on the special circumstances of the German reunification that, over night, made a large set of novel consumption goods available and affordable for the general population. New food products becoming available and affordable to population masses is a generalizable and pervasive fact of economic growth and development. The business model of the international food industry largely depends on employing food engineering technology and mass marketing strategies to design and introduce novel food products into the market (Dodgson et al., 2014).[1] Simultaneously, international trade and technological innovation have made delicatessen that were previously not affordable to the masses—such as exotic fruit and fresh exotic fishery products like salmon, oysters, or caviar—available in discount grocery chains around the corner.[2] The increased availability of new products is also witnessed by the incredibly large variety of products for sale in modern supermarkets. In 1946, the average supermarket carried 2,500 products, in 1975 it carried about 9,000 products, and today it carries almost 44,000 products (Congressional Research Service, 2013; Food Marketing Institute, 2014a,b).[3] Although a significant number of food items sold at supermarkets are certainly substitutes, the fact that the average supermarket carries four times more products than in the 1970s, and seventeen times more than in 1946, underlines the idea that novelty consumption is a characteristic feature of economic growth.

This paper's theoretical section provides general predictions for the demand of novel and familiar food. Applied to the German case, we show how the consumption patterns of East and West Germans would differ under three competing scenarios. First, under the null hypothesis of no taste nor habit

[1] In the US, the number of food chemistry patents has tripled from 668 to 2134 between 1980 and 2012 (World Intellectual Property Organization (WIPO), 2014). As an example from specific ingredients for functional food, probiotic patents increased from 4 to 61 between 1999 and 2009 (Bornkessel et al., 2014), and phytosterol ("plant sterols") patents increased from 35 to 180 in the same time period worldwide (Curran et al., 2010).

[2] Before commercial salmon farming was established in the 1970s, (wild) salmon was very expensive, a delicacy that would cost around $5 per quarter pound (in nominal terms in the US), and that was only available in specialized delicatessen stores (Fishman, 2006; Henson, 2008). Today, ALDI supermarkets sell pink salmon fillets for $4.84 per pound (as on November 14, 2014 in the ALDI store in Ithaca, NY) while household income has increased by a factor 3.5. Whether Atlantic salmon raised under aquaculture conditions is of lower quality is controversial (US Food and Drug Administration, 2014). As another example, in 1978 a pineapple cost $0.29 in Illinois and an average US household had to spent 4.5% of its daily income to buy a pineapple. Today, ALDI sells them for $1.29 each, and the relative price has decreased to 1.3% of the daily income (assuming that taxes and deductions add up to 30% of the gross wage (United States Census Bureau, 1980, 2014).

[3] Walmarkt, the world's largest company, stands representative for the success of supermarket chains offering more and more food products under one roof. On their web page, Walmarkt posts ingredients for 20,000 different food products offered in more than 3,000 stores all over the US (Blatt, 2014).

formation, *ceteris paribus*, East and West Germans would display the same consumption patterns after the reunification. Second, if preferences feature habit formation, novel food consumption would be higher in East than in West Germany after the reunification. Third, if preferences feature taste formation, novel food consumption would be lower in East than in West Germany. Analogously, empirical evidence on differences in familiar food consumption also reveal whether intertemporal preferences feature habit formation, taste formation, or neither of the two. Notably, these theoretical predictions can be tested using representative cross-sectional data on East and West Germany. This is a great advantage for the empirical analysis because it relaxes the requirement for panel data to track and characterize individual consumption choices over time.

In that respect, this paper contributes to the literature that develops empirical tests for the existence of habit formation. Proving the existence of habit formation and non-separable time preferences has major implications for macroeconomic models, which typically rely on such properties (Fuhrer, 2000; Attanasio and Weber, 2010). Although a lot of effort to develop such tests has been invested in the last decades, the findings have been inconclusive. Early study based on aggregated data typically find evidence for habit formation (e.g. Braun et al. (1993)), whereas some individual panel-data based studies tend to find the opposite (Dynan, 2000; Kuismanen and Pistaferri, 2006) although other micro-based studies also find support for habit formation (Carrasco et al., 2005; Collado and Browning, 2007). This paper's theory develops a test for the existence of non-time separable preferences when applied to the unique historical case of the German reunification. Moreover, the test can discriminate between habit and taste formation.

The second part of the paper carries out the empirical test by exploiting three cross-sectional datasets that are all representative in East and West Germany. These datasets include a battery of current and retrospective information on food consumption (and also objective body weight measures). We find that, shortly after novel western food products became available in the GDR, a significant share of East Germans persistently changed their diet and started to consume these products. Specifically, East Germans' consumption of novel food—which they could not consume before the reunification—significantly increased. More importantly, novelty consumption exceeded West German levels in 1991. This 'novelty effect' holds for both healthy novel food, such as exotic fruits, and unhealthy novel food, such as convenience food. In contrast, East Germans' potato consumption was three times higher before the reunification and fell below West Germans' level after the reunification. According to our theoretical model, all these consumption patterns are consistent with non-separable time preferences featuring habit formation. Interestingly, the changes in eating habits are persistent and still detectable one decade after the

reunification. Importantly, the observed consumption patterns cannot be explained by taste for variety alone.

Although consumption choices of novel and familiar food are theoretically optimal because they maximize the consumer's intertemporal objective function, they may not necessarily optimize body weight, which is just a component of overall utility (Cawley et al., 2015). Hence, how and whether body weight changes in response to a mix of healthy and unhealthy food consumption choices is essentially an empirical question.

We find that, relative to West Germans, significantly more East Germans gained weight shortly after the fall of the Wall. The more-than-proportional weight gain cannot be explained by less physical activity and calorie output, nor is it the result of worse health care access or lower awareness about medical conditions among East Germans. We also provide evidence that unemployment is unlikely to be the driving force because mostly the working middle-class gained body weight. The increase in body weight is persistent as well. Even 15 years after the reunification, the (positively selected) group of East Germans who migrated to West Germany still shows significantly higher BMIs than native West Germans.

The next section discusses this paper's specific contributions in the context of the existing literature. Section 3 briefly summarizes events around the German reunification and food availability in the GDR. Section 4 formalizes our 'Theory of Novelty Consumption' and Section 5 provides the empirical evidence. The last section concludes.

2 Specific Contributions to the Existing Literature

This paper contributes to and bridges several important strands of the economic literature, most importantly *(a)* studies that empirically and theoretically model reasons for the obesity epidemic in developed countries, and *(b)* studies that empirically and theoretically test for non-separable time preferences, habit and taste formation.

By investigating how availability and novelty can produce long-lasting demand responses for food consumption, our paper contributes to the literature on the role of economic development and technological change as driving forces behind the obesity epidemic (Philipson and Posner, 1999; Cutler et al., 2003; Egger et al., 2012; Costa-i Font and Mas, 2014). Philipson and Posner (1999), Lakdawalla et al. (2005) and Lakdawalla and Philipson (2009) develop an elegant theory which links technological change

and increases in body weight to rising incomes and decreasing food prices. However, Cutler et al. (2003) argue that the rise in the overall US Food Consumer Price Index was only 3% below the corresponding index for non-food between 1970 and 1999. Maybe in contrast to the public perception, at least *average* real food prices have been surprisingly constant over time. To be specific, average food price inflation was 5.2% between 1960 and 1983 and has been 3.0% since then (Congressional Research Service, 2013).[4] Strulik (2014) argues that being obese is more acceptable the higher the population obesity rate, which would create a social multiplier effect. This would foster the obesity epidemic even when initial triggers such as decreasing prices become less relevant. Our concept of novelty consumption also proposes a possible explanation for the fact that obesity rates continue to rise even though real food prices have been very stable since the 1990s (Ruhm, 2012). This paper builds upon and specifies Philipson and Posner (1999), Lakdawalla et al. (2005) and Lakdawalla and Philipson (2009)'s main idea. Furthermore, it extends it by considering the joint effect of more food availability as well as previous consumption experiences on food consumption.

Our theoretical approach builds on, and contributes to, the literature on habit formation and intertemporal preferences (Abel, 1990; Heaton, 1993; Dynan, 2000; Overland et al., 2000; Carroll, 2000; Carrasco et al., 2005; Collado and Browning, 2007; Rozen, 2010), learning in consumption and taste formation (Stigler and Becker, 1977), rational addiction (Becker and Murphy, 1988), and health formation (Grossman, 1972). One special feature of our model is that it requires no *a priori* assumptions on how past consumption affects current preferences. Based on the observed East-West consumption differential, we are able to infer how past consumption affects preferences for current food consumption, which is typically an unobserved property of the utility function. In particular, we show that preferences featuring habit formation are revealed by consumption patterns that overshoot in response to exogenous shocks. On the contrary, taste formation implies undershooting and monotonic paths of consumption over time.

Our empirical strategy is complementary to the one adopted in the literature that uses microdata to identify and carve out the causal impact of single specific factors on obesity, such as increased availability of (fast food) restaurants (Currie et al., 2010; Dunn, 2010; Anderson and Matsa, 2011), consumption of soda (Fletcher et al., 2010), increases in portion sizes (Jeitschko and Pecchenino, 2006), increases in gluttony (Griffith, 2015), decreases in gas prices (Courtemanche, 2011), increase in cigarette taxes (Courtemanche, 2009), changes in food prices (Grossman et al., 2014; Dubois et al., 2014; Courte-

[4]The analogous numbers for the general inflation rates were 5.3 and 2.9%, i.e., almost identical and also almost perfectly correlated.

manche et al., 2015; Griffith et al., 2015), or changes in physical activity (Cawley et al., 2013; Sarma et al., 2014).[5] These studies are all econometrically 'clean' and allow one to focus on a sophisticated single causal factor (often related to the supply-side). However, these clean causal reduced form studies typically find modest effects that are at odds with the general obesity epidemic. We opt for a slightly different empirical approach and provide a 'big picture' perspective when exploiting the German reunification as a large-scale exogenous source of variation.

The existing literature exploiting the reunification has studied outcomes such as life and health satisfaction (Frijters et al., 2004a,b, 2005), saving behavior (Fuchs-Schündeln and Schündeln, 2005; Fuchs-Schündeln, 2008), preferences for social policies (Alesina and Fuchs-Schündeln, 2007), educational and labor outcomes (Fuchs-Schündeln and Masella, 2015), social norms (Brosig-Koch et al., 2011), trust (Rainer and Siedler, 2013), risk taking and propensity to cooperate (Heineck and Süssmuth, 2013), social ties (Burchardi and Hassan, 2013) and conspicuous consumption (Friehe and Mechtel, 2014).

Admittedly, the downside of the reunification approach is that one cannot trace changes in outcome variables back to single specific factors. However, the crucial advantage of the fall of the Wall is its quality as a natural experiment of economic development, leading to greater product availability. Usually, economic development involves very slow long-term changes in multiple factors that are almost impossible to identify by conventional reduced-form methods. We deliberately want to study the net impact of abrupt changes in multiple factors of economic development; most importantly, the role of new food consumption opportunities.

3 The German Reunification and Food Availability Under Socialism

3.1 Division and Reunification of Germany

After World War II (WWII), Germany's boundaries changed substantially from its pre-war borders. At the Potsdam Conference in summer 1945, the allies divided Germany into four military occupation zones: American, British, French, and Soviet zones. The division was based on the idea of allocating territory proportional to the size of the nations' army and according to military considerations (Mee, 1977).

[5] There exists yet another literature strand that identifies the impact of (adverse) early childhood conditions on health, and particularly obesity, later in life. These empirical reduced-form papers exploit exposure to World World II (Kesternich et al., 2014, 2015), famines in the 20^{th} century (Lindeboom et al., 2010; van den Berg et al., 2015), or recessions (van den Berg et al., 2006; Scholte et al., 2014). Another related literature strand studies food consumption outside of the obesity context, and mostly in the context of the US food stamp program (Dynan, 2000; Blundell and Pistaferri, 2003; Fisher et al., 2008; Hoynes and Schanzenbach, 2009; Jappelli and Pistaferri, 2010; Wakabayashi, 2010; Hoynes and Schanzenbach, 2012). The last related literature strand studies the phenomenon that people seems to be healthier during recessions (Ruhm, 2000, 2005).

In 1949, the capitalist and democratic Federal Republic of Germany (FRG) was founded, comprising of the French, British, and American military occupation zones. In the Soviet zone, the German Democratic Republic (GDR)—a totalitarian Stalin-oriented communist state—was forged in 1949.[6] Between 1950 and 1961, about 3.6 million refugees migrated from the GDR to the FRG (Bethlehem, 1999).

To stop the mass exodus, on August 13, 1961, the communist GDR regime started erecting a 155 kilometers (96 miles) long cement and 3.6 meter (12 feet) high "Berlin Wall" around West Berlin. Outside of Berlin and around the rest of the GDR territory, a physically different, but technically very similar 1,393 kilometer (866 miles) long "Inner German Border" was erected (see Figure A2 in the Appendix). This border ran from the Baltic Sea to Czechoslovakia and represented the boundary of the "Iron Curtain." Henceforth, we loosely refer to the whole Inner German border as the "Wall."

For 28 years, from 1961 to 1989, the Wall served as border between the FRG and the GDR. It largely prevented East-West migration, although around 5,000 GDR citizens attempted to escape over the Berlin Wall alone; between 100 and 400 lost their lives at this attempt (Hertle, 2009). After mass demonstrations by the GDR residents, the communist regime decided to allow East-West migration on November 9, 1989. The fall of the Wall was completely unanticipated and unexpected. On October 3, 1990, Germany officially reunited and became one state again.

3.2 Availability, Prices and Consumption Before the Reunification

> "Bananas and exotic fruits have a special symbolic meaning in the relationship between the FRG and the GDR. [...] Initially, the banana [...] [was] symbolic for the shortages and lack of consumer goods in the East. [...] The banana can also be reminiscent of the run on certain goods shortly after fall of the Berlin wall (p. 144, Patent, 2013)."

The epigraphs above nicely illustrates some of the facts concerning food choices around the time of the German reunification. First of all, note that the GDR was the richest and most prosperous socialist economy, e.g., when compared to the Union of Soviet Socialist Republics (USSR). In 1990, it was the 21st biggest economy in the world. Its Gross Domestic Product (GDP) per capita was $9,679 (West Germany: $15,300; US: $21,082) (CIA World Factbook, 1990; Classora Knowledge Base, 2014). However, although the population of the GDR did not suffer from malnutrition or hunger, food was only produced within the GDR or imported from other socialist countries, mostly the USSR. This led to a restricted food availability in the GDR.[7] The GDR state food policy heavily subsidized basic food such as pota-

[6] Henceforth, we use the terms GDR and East Germany, and the terms as FRG and West Germany interchangeably.
[7] Official state rationing on food was abolished in the 1960s in the GDR (Bochniak, 2009).

toes, milk or butter. Consequently, the state-determined prices were relatively low and comparable with those in the FRG (where basic food was also subsidized).

Table 1 shows consumption per capita and prices for select staple food categories in the GDR (1989) and the FRG (1988). First, we see that potato consumption was three times higher in the GDR in 1989 (9.7 kg vs. 3.03 kg per month and person). One reason lies certainly in the limited availability of food substitutes, another potentially in prices differences. Relative to disposable household income, potato prices were only half as high in the GDR (0.02% vs. 0.04%). However, given the extremely low prices of potatoes, the demand elasticity of potatoes is very low. Hsieh et al. (2009) use US Nielsen Scanner data and show that the own price elasticity for the most popular potato consumed at home, the Russell potato, is -0.1 and not statistically different from zero. It is very likely that the availability of substitute food, not prices, account for the three times higher potato consumption in East Germany.

[Insert Table 1 about here]

Second, Table 1 illustrates that GDR residents consumed slightly more than 5 kg (12lbs) meat per month and per person, whereas the FRG consumption was slightly below 5 kg. Although absolute prices for meat were slightly higher in West Germany–net household income was about 50% higher in the West—relative meat prices were lower in West Germany.[8]

Third, although comparable, egg and sugar consumption was higher in West as compared to East Germany. According to official data, egg and sugar consumption was 22% and 32% higher in West Germany (25.4 vs. 31 eggs, and 1.18 vs. 1.56 kg of sugar per person/month).

Finally, Table 1 displays prices and consumption of exotic fruits. Western products were officially not available in the GDR. Only people with friends and relatives in West Germany had partial access to these products. Imports came only from 'friendly' socialist countries such as the USSR or Cuba. Consequently, exotic fruits were basically not available or only available at horrendous prices that normal people were not able to pay. The last row of Table 1 shows that GDR citizens had to pay an equivalent of € 12 ($16) for a can of pineapples, which were only available in delicatessen stores. In the local currency, the price was 18 Ostmark and represented 7.2% of the net weekly income of a single household. This equaled the price for a train ticket over 200km (124 mi) (Böhme, 1971; Schwarzer, 1999; Woll, 2012; Maecker, 2013)

[8]Note that this table likely contains measurement errors due to limited data availability and comparability. Particularly the comparison of net household incomes per person is based on several assumptions. For the GDR, we use net household incomes according to the Zentralverwaltung für Statistik der DDR (1988) and for the FRG equalized disposable household incomes according to the German Socio-Economic Panel Study (SOEP) (Wagner et al., 2007; Grabka, 2000).

In summary, *(i)* people did not suffer hunger in the GDR, but food choices were limited and mostly locally produced products were made available; *(ii)* basic (familiar) food such as potatoes, meat, eggs or sugar was subsidized by the government—in East as well as in West Germany—which kept prices low; *(iii)* it is reasonable to assume that the quality of staple food was comparable in East and West Germany; *(iv)* western products and imported products from non-communist countries were only available in West Germany; *(v)* meat consumption was comparable, potato consumption three times as high, sugar consumption lower, and exotic fruit consumption dramatically lower in the GDR as compared to the FRG.

4 A Theory of Novelty Consumption

Consider an intertemporal optimization problem where a consumer has a taste for variety and non-separable time preferences. We provide closed-form expressions for the equations to be estimated. Depending on the empirically observed food consumption pattern, and based on the predictions of the theoretical model, we will be able to infer whether consumers' preferences feature habit formation or taste formation. Consider the following instantaneous utility function:

$$\mathcal{U}\left(n_t, f_t, g_t, N_t, F_t, W_t, Z\right). \tag{1}$$

At each point in time, the choice variables are n_t, f_t and g_t. The vector n_t represents novel food that only became available in East Germany after the reunification, e.g., exotic fruits and fast food. In contrast, n_t has always been available in West Germany. In contrast, vector f_t denotes familiar food that has always been available in both parts of Germany, e.g. potatoes, meat, sugar or eggs. Non-food activities, such as physical exercise, and non-food consumption, such as cars, are represented by g_t. The utility function is assumed to be concave in the choice variables to ensure that the consumer has a taste for variety.

Non-separability in intertemporal preferences comes from the assumption that past consumption experience with novel and familiar food—which we denote by N_t and F_t, respectively—affects the instantaneous utility function. In principle, this may occur in two ways. A first possibility is that N_t and F_t only affect the level of current utility, in which case the derivatives $\mathcal{U}_N$ and $\mathcal{U}_F$ are different from zero. A second, and more interesting case, is that N_t and F_t also affect the marginal utility of current consumption, as formally captured by the sign of the two cross derivatives $\mathcal{U}_{nN}$ and $\mathcal{U}_{fF}$.

We can distinguish three cases. First, when the cross derivative is negative ($\mathcal{U}_{nN}, \mathcal{U}_{fF} < 0$), past consumption has a satiating effect which reduces the marginal utility of current consumption. Consistent with the macroeconomic literature (see, e.g, Abel, 1990; Overland et al., 2000; Carroll, 2000), we label this case as *habit formation*. Second, when the interaction term is positive ($\mathcal{U}_{nN}, \mathcal{U}_{fF} > 0$), past consumption has a reinforcing effect on the marginal utility of consumption, as it is typically assumed in the literature on *taste formation* (Stigler and Becker, 1977; Becker and Murphy, 1988). Finally, when $\mathcal{U}_{nN} = \mathcal{U}_{fF} = 0$ preferences are neither habit forming, nor taste forming, although past consumption can still affect the level of current utility (depending on the sign of $\mathcal{U}_N$ and $\mathcal{U}_F$). Past consumption experiences are assumed to evolve according to the following linear dynamics:

$$\dot{N}_t = n_t - \delta N_t, \qquad \dot{F}_t = f_t - \delta F_t \tag{2}$$

The term W_t denotes body weight, which depends on current and past eating behavior (Levy, 2002; Dragone, 2009), on physical exercise γ (which is one component of vector g), and on individual characteristics Z:

$$W_t = W\left(n_t, f_t, \gamma_t, N_t, F_t, Z\right). \tag{3}$$

Given income M_t, assets A_t, the market interest rate r_t, and the price p_t^j of good j at time t—which includes the opportunity cost of time and the transaction costs required to obtain the good—the dynamic budget constraint is

$$\dot{A}_t = r_t A_t + M_t - p_t^n n_t - p_t^f f_t - p_t^g g_t \tag{4}$$

To ease the notation, the utility function $\mathcal{U}\left(n_t, f_t, g_t, N_t, F_t, W\left(n_t, f_t, \gamma_t, N_t, F_t, Z\right), Z\right)$ can be rewritten as $U\left(n_t, f_t, g_t, N_t, F_t, Z\right)$. The consumer chooses the path of food and non-food consumption that solves the following dynamic programming problem:

$$\max_{\{n_t,f_t,g_t\}} \int_0^\infty e^{-\rho t} U\left(n_t, f_t, g_t, N_t, F_t, Z\right) dt \tag{5}$$

$$\text{s.t. } \dot{A}_t = r_t A_t + M_t - p_t^n n_t - p_t^f f_t - p_t^g g_t \tag{6}$$

$$\dot{N}_t = n_t - \delta N_t \tag{7}$$

$$\dot{F}_t = f_t - \delta F_t \tag{8}$$

given the intertemporal discount factor ρ. As noted in the previous section, at the time of the re-unification ($t = 0$), the consumption experiences with novel and familiar food were different in East and West Germany. Denote with N_0^E and F_0^E the initial food consumption experiences in East Germany, and with N_0^W and F_0^W the corresponding ones in West Germany. Recall that $N_0^E = 0$ in East Germany and $N_0^W > 0$ in West Germany. Familiar food experience is instead positive in both parts of Germany, $F_0^E > 0$ and $F_0^W > 0$, although possibly different for different types of familiar food.

The Hamilton-Jacobi-Bellman equation associated to problem (5)-(8) is

$$\rho \mathcal{V}\left(N_t, F_t, A_t\right) = \max_{\{n_t,f_t,g_t\}} \left\{U\left(n_t, f_t, g_t, N_t, F_t, Z\right) + \mathcal{V}_N \dot{N}_t + \mathcal{V}_F \dot{F}_t + \mathcal{V}_A \dot{A}_t\right\} \tag{9}$$

where $\mathcal{V}\left(N_t, F_t, A_t\right)$ is the optimal value function. The following first order conditions must be satisfied by optimal food and non-food consumption:

$$U_n = p_t^n \mathcal{V}_A - \mathcal{V}_N, \qquad U_f = p_t^f \mathcal{V}_A - \mathcal{V}_F, \qquad U_g = p_t^g \mathcal{V}_A, \tag{10}$$

With non-separable intertemporal preferences, the optimal consumption choices at each point in time depend not only on prices and income, but also on the impact that current choices have on future utility via the accumulation of consumption experiences and assets.

The terms $\mathcal{V}_N$ and $\mathcal{V}_F$ are the shadow prices of N_t and F_t and they measure how a marginal change in past consumption affects the intertemporal utility of the agent. When $\mathcal{V}_N = \mathcal{V}_F = 0$, the first order conditions above boil down to the familiar conditions for utility maximization where the marginal rate of substitution equals the relative price. $\mathcal{V}_A$ is the shadow price of assets.

4.1 Consumption Patterns with Non-Separable Intertemporal Preferences

For analytical tractability, and to provide linear closed-form solutions that can be empirically estimated, we follow Becker and Murphy (1988) and consider a quadratic representation of the utility function:

$$U\left(n_t, f_t, g_t; N_t, F_t, Z\right) = f_t\left(\hat{f} - \frac{f_t}{2}\right) + n_t\left(\hat{n} - \frac{n_t}{2}\right) + g_t\left(\hat{g} - \frac{g_t}{2}\right) + U_{fF} f_t F_t + U_{nN} n_t N_t. \tag{11}$$

Note that we do not make any *a priori* assumption on whether preferences feature habit formation or taste formation, which are properties that will be inferred from the empirical exercise.[9] As shown in Appendix C, the following holds:

Proposition 1. *At each point in time, optimal consumption of novel and familiar food can be expressed as a linear function of consumption experience at time* 0

$$n_t = \alpha_t + \beta_t N_0 \tag{12}$$

$$f_t = \kappa_t + \phi_t F_0 \tag{13}$$

The coefficients α_t and κ_t depend, among other factors, on market prices, available income and wealth, as well as on individual characteristics and time. The coefficients β_t and ϕ_t only depend on individual characteristics and on time, and they measure differences in consumption levels between East and West Germans at a given point in time t :

$$\Delta n_t^{EW} = n_t^E - n_t^W = -\beta_t N_0^W \tag{14}$$

$$\Delta f_t^{EW} = f_t^E - f_t^W = \phi_t\left(F_0^E - F_0^W\right). \tag{15}$$

Equations (12) and (13) will be estimated in the empirical section. In addition, we will estimate the differences in consumption levels at two different points in time, t and s, with $t > s$. Using (12) and (13), this amounts to estimate

[9] The positive parameters $\hat{f}, \hat{n}$ and $\hat{g}$ depend on individual characteristics and they represent, absent budget constraints and past consumption experiences, the (exogenously given) bliss consumption point of n, f and g. Non-satiation can be guaranteed, if necessary, by assuming that the bliss points are large enough to be economically unfeasible.

$$\Delta n_{ts} = n_t - n_s = \alpha_{ts} - \beta_{ts} N_0 \tag{16}$$

$$\Delta f_{ts} = f_t - f_s = \kappa_{ts} + \phi_{ts} F_0 \tag{17}$$

where β_{ts} and ϕ_{ts} measure differences-in-differences between consumption levels in East and West Germany at time t and s :

$$\Delta n_{ts}^E - \Delta n_{ts}^W = -\beta_{ts} N_0^W \tag{18}$$

$$\Delta f_{ts}^E - \Delta f_{ts}^W = \phi_{ts} \left(F_0^E - F_0^W \right). \tag{19}$$

Note that detecting differences in post-reunification consumption levels, either over time, or between East and West Germany, reveals whether preferences feature habit or taste formation. The possibility of detecting differences crucially depends on the speed of convergence to the equilibrium and on the time-window of observation. When the adjustment paths approach the long-run equilibrium, all post-reunification differences in consumption vanish and no specific inference can be made.

4.2 Inferring Habit or Taste Formation from Post-Reunification Cross-Sectional Data

We conceptualize the impact of the reunification on consumers via the sudden availability of novel food. Moreover, we formalize the sudden availability as a negative price shock making novel consumption goods available and affordable for the general population. In the case of East Germany, a novel good conceptualization in the form of a price decrease is appropriate because, technically, products that existed in capitalist countries were also available on the black market in the GDR, via personal connections. They were sometimes even available in official stores but at horrendous prices or transaction costs.

This approach allows us to focus on a preference-driven explanation of consumption patterns after the reunification. It also allows us to concisely summarize in a single economic variable—the price—the variety of changes that typically accompany economic development. These include a decrease in prices relative to disposable income, the launching of new products for the mass market thanks to technological innovation or to the removal of trade barriers, structural changes in the food industry, decreases in

transaction costs due to the diffusion of supermarkets and grocery stores, and changes in distribution networks.

As virtually implied by any economic model, a preference for variety would predict that consumption of novel food increases when its price decreases.[10] The magnitude of this increase in consumption, however, depends on the impact of past consumption on current preferences. In the following, we make the standard assumption that East and West Germans would have exhibited the same consumption behavior if they had not experienced the division of Germany. What's more, in the long-run they would exhibit the same consumption behavior in unified Germany. We assume that the law of one price holds in reunified Germany. Consequently, observed differences in consumption levels would only be due to the exposure to socialism.

For familiar food, we additionally assume that the pre-reunification consumption levels represent their pre-reunification steady states. These could differ in the GDR and FRG due to differences in, e.g., prices or relative incomes. Note that, in our econometric models, we empirically control a rich set of socio-demographic characteristics, including household income.

Proposition 2. *Immediately after the reunification, consumption of novel food increases. During the transition to the long run equilibrium:*

1. *East Germans consume as much novel food as West Germans if it is neither habit nor taste forming:* $U_{nN} = 0 \Rightarrow n_t^E = n_t^W$
2. *East Germans consume more novel food than West Germans if and only if it is habit forming:* $U_{nN} < 0 \Leftrightarrow n_t^E > n_t^W$,
3. *East Germans continue to consume less novel food than West Germans if and only if it is taste forming:* $U_{nN} > 0 \Leftrightarrow n_t^E < n_t^W$.

East and West Germans consume the same amount of novel food when they reach the new long-run equilibrium.

Proposition 2 implies that the simple measurement of post-reunification East-West differences in consumption levels—after adjusting consumption for wage and socio-demographic differences—is sufficient to infer whether (unobservable) time preferences feature habit or taste formation.[11]

[10] An obvious exception are Giffen goods.

[11] Similar consumption levels can be observed for three main reasons: (i) preferences are time separable (ii) preferences are non-separable, but $U_{nN}, U_{fF} = 0$, (iii) U_{nN}, U_{fF} are non nil, but the long run equilibrium has been reached. For this reason, $U_{nN} = U_{fF} = 0$ is a sufficient, but not a necessary condition for the absence of differences in consumption levels.

[Insert Figures 1 and 2 about here]

Figure 1 illustrates dynamic consumption patterns of the novel food differential ($n_t^E - n_t^W$) between East and West Germans. This is the sufficient statistic for the empirical test. Before the reunification, the consumption differential is negative because novel food consumption was essentially zero in East Germany. After the reunification, novelty consumption unambiguously increases in East Germany. Under habit formation, the desirability of novel goods is high when consumption experience is low. Hence, under habit formation, post-reunification consumption levels would be higher in East than in West Germany. Over time, when consumption experiences have accumulated, eastern consumption would decrease and converge to western levels. In contrast, under taste formation the desirability of novel goods is low when consumption experience is low. When this is the case, post-reunification consumption in the East would be lower than in the West, but the consumption of the novel good *increases* with consumption experiences over time (see Figure 1). In both cases, in the long-run, the good will no longer be novel and consumption in the East will converge to consumption in the West.[12]

Figure 2 illustrates dynamic consumption patterns of familiar food in East and West Germany, $f_t^E - f_t^W$. In analogy to Proposition 2: When the pre-reunification consumption of familiar food was lower in East as compared to West Germany (which is the relevant case for sugar), then habit forming preferences for familiar food would be revealed by higher post-reunification consumption in East Germany. In contrast, taste forming preferences would be revealed by continuously lower post-reunification consumption.

In the following propositions, we consider the two remaining cases: higher (potatoes) or equal (meat) pre-reunification consumption of familiar food in the East:

Proposition 3. *Suppose that pre-reunification consumption of familiar food was higher in East than in West Germany: $f_0^E > f_0^W$. During the transition to the long run equilibrium:*

1. *East Germans consume less familiar food than West Germans if and only if it is habit forming: $U_{fF} < 0 \Leftrightarrow f_t^E < f_t^W$,*

2. *East Germans continue to consume more familiar food than West Germans if and only if it is taste forming: $U_{fF} > 0 \Leftrightarrow f_t^E > f_t^W$.*

[12] Our theoretical results are related to Becker and Murphy (1988)'s finding that present consumption is positively related to past consumption if reinforcement is large enough (which, in Becker and Murphy (1988) requires $U_{nN} > -U_{NN}/(2\delta + \rho)$) and negatively related otherwise. In the former case, the literature speaks of 'adjacent complementarity' while the latter case is labeled 'distant complementarity' (Ryder and Heal, 1973). Note that in our setup $U_{NN} = 0$.

East and West Germans consume the same amount of familiar food when they reach the new long-run equilibrium.

Proposition 4. *Suppose that pre-reunification consumption of familiar food was equal in East and in West Germany:* $f_0^E = f_0^W$. *Then no consumption difference should be observed after the reunification:* $f_t^E = f_t^W$.

Hence, equal pre-reunification levels in consumption of familiar food provide sufficient information to predict that no difference will be observed afterwards. If, instead, differences in pre-reunification consumption levels do exist, then one can exploit the subsequent consumption dynamics to infer the underlying intertemporal preferences for food consumption, as shown in Figure 2.

To summarize, habit formation is revealed by consumption pattern that overreact to exogenous shocks in prices and are non-monotonic in time. Taste formation, instead, features a smoother response to the shock, as consumption reacts less at the time of the shock, and is followed by a monotonic adjustment to the long-run equilibrium.

In the following section, we test our theoretical predictions. Because consumption differences between East and West Germans at a given point in time provide sufficient statistics, repeated cross-sections are sufficient to test for non-separable intertemporal preferences.

5 Empirical Analysis

5.1 Estimating the Model Empirically

Equations (12) and (13) and equations (16) and (17) provide the theoretical underpinning for the empirical models. In each of these equations, the first term $(\alpha_t, \kappa_t, \alpha_{ts}, \kappa_{ts},)$ represents the effect of individual characteristics—such as *Demographics*, *Education*, *Employment* and *Income*—on consumption levels. The second term represents the different consumption experiences at the time of the reunification, which proxies having lived in the GDR vs. the FRG. In this section we estimate two empirical models. The first model empirically estimates equations (12) and (13), and reads:

$$\begin{aligned} y_{it} &= \alpha + \beta EastGerman_i + \psi EastGerman_i \times y1998_t \\ &\quad + \gamma Demographics_i + \delta Education_i + \theta Employment_{it} + \omega Income_{it} + \rho_t + \epsilon_i. \end{aligned} \tag{20}$$

Variable y_{it} stands for the following dependent variables (see Table B1 for the corresponding summary statistics):

- Food consumption by individual i at time t, *t=[1991, 1998]*,
- Objective Body Mass Index (BMI), overweight and obesity measures of individual i at time t, *t=[1991, 1998, 2005]*.

Our main variable of interest is the dummy $EastGerman_i$, which is the empirical counterpart of the theoretically modeled consumption experience with novel and familiar food at time 0. It indicates whether the respondent was living in East or West Germany prior to 1989. The corresponding coefficient β represents East-West level differences in food consumption and body mass in 1991. It represents the relationship between y_{it} (food consumption) and transitioning from socialism to capitalism, from a limited socialist food basket to a much larger capitalistic one. Most importantly, when considering novel and familiar food consumption, the sign of β will be informative of whether intertemporal preferences feature habit or taste formation, according to Propositions 2, 3 and 4.

When $t = 1998$, the dummy variable $y1998_t$ is equal to one. The coefficient ψ measures the change in food consumption for East Germans between 1991 and 1998.

Because employment, individual income and other socio-demographic factors affect the demand for food, we also consider $Demographics_i$, a vector of six socio-demographic covariates, $Education_i$, a vector of three educational dummy variables, and $Employment_i$, a vector of seven labor market related controls (see Tables B1 and B2 in the Appendix). Month and year fixed effects are included to control for the interview month and year (ρ_t). As usual, ϵ_i is the error term.

When the dependent variable elicits *changes* in food consumption, rather than levels, the corresponding theoretical equations that we estimate are (16) and (17). The empirical model can then be written as:

$$\begin{aligned} \Delta y_{it} = \quad & \tilde{\alpha} + \tilde{\beta} EastGerman_i + \tilde{\psi} EastGerman_i \times y1998_t \\ & + \tilde{\gamma} Demographics_i + \tilde{\delta} Education_i + \tilde{\theta} Employment_i + \tilde{\omega} Income_i + \rho_t + \epsilon_i \end{aligned} \tag{21}$$

where Δy_{it} represents:

- Change in food consumption by individual *i* between *t-3* and *t*, *t=[1991]*, i.e., between 1988 and 1991.

- Change in body weight of individual *i* between *t-3* and *t*, *t=[1991, 1998]*, i.e., between 1988 and 1991, and between 1995 and 1998.

The empirical coefficient $\tilde{\beta}$ can then be interpreted as an East-West difference-in-differences (DiD) estimator. Coefficient $\tilde{\psi}$ has a similar interpretation, although it assesses the medium term effects of a treatment where East Germans are the treated and West Germans the control group.

5.2 Identification

The literature exploiting the German reunification as a natural experiment (Frijters et al., 2004b,a, 2005; Fuchs-Schündeln and Schündeln, 2005; Alesina and Fuchs-Schündeln, 2007; Fuchs-Schündeln, 2008; Brosig-Koch et al., 2011; Rainer and Siedler, 2013; Heineck and Süssmuth, 2013; Burchardi and Hassan, 2013; Friehe and Mechtel, 2014; Fuchs-Schündeln and Masella, 2015) rests on a set of assumptions which are standard and widely accepted (see Appendix 8 for a detailed discussion).

A main assumption is that both the division and reunification of Germany were unexpected and quasi-random events that divided an otherwise united, and thus similar, population (Bleich et al., 2008). In addition, one assumes that post-reunification unobservables have not affected the outcomes differentially in East and West Germany. More precisely, if those unobservables exist (e.g. trust or uncertainty about the future) then they should at least be correlated with the treatment 'life under socialism.' If that is the case, then post-reunification differences in the outcome variable of interest can be interpreted as an overall reduced form "intention-to-treat" effect of the transition from "life under socialism" to capitalism.

Given our focus on individual preferences and demand for food consumption, differences in purchasing power could bias our estimates. For this reason, we explicitly consider individual income and assets in the theoretical model. In the empirical exercise, we control for employment, income, and other socio-demographics.

Finally, East Germans who migrated between 1989 and 1991 to West Germany are not captured in the surveys and introduce measurement error which likely attenuates our estimates. To the extent that the (mostly young and healthy) migrants were more responsive to novel food consumption, our estimates represent a lower bound.

5.3 Data Description

5.3.1 German National Health Survey East-West 1991 (*GNHSEW91*)

The first dataset used is the *German National Health Survey East-West 1991* (*GNHSEW91*), a representative cross-sectional survey that was in the field in East and West Germany between 1990 and 1992 (Robert Koch Institut, 2012b) A lot of information surveyed is food consumption and health-related. Excluding individuals with missing responses on relevant variables, the sample consists of 2,160 East and 4,390 West German respondents. We do not restrict the sample further.

Dependent variables. We exploit a battery of food consumption and body mass variables, in addition to measures to be exploited for robustness checks and to test for mechanisms. Overall, we group the dependent variables into four main categories (see Table B1 in the Appendix). The first category comprises self-reported measures of *Current Food Consumption Levels*. Table B1 shows that 54% of the population eats wholegrain bread daily, 26% eat non-processed—boiled, baked or smashed—potatoes daily, and 57% eats fresh fruits daily. Meat is consumed by 75% on a weekly basis; eggs (23%) as well as pie and cookies (36%) are consumed by a significant share more than once a week. We exploit these categories of *Current Food Consumption Levels* to estimate equation (20).

The second category elicits *Changes in Food Consumption in the last 3 Years*. We use these dependent measures to estimate equation (21). East Germans were interviewed between September 1991 and October 1992, which means the consumption changes in the past three years refer exactly to consumption changes around the fall of the Wall in 1989. A quarter of all respondents consumed more wholegrain, but meat was obviously not consumed at higher quantities. As seen in Table B1, 34% of all respondents consumed more fresh fruits—an effect that is largely driven by East Germans.

The second category also includes objective weight and height measures, as well as self-reports on whether respondents *Changed Diet* and *Gained Weight* in the last three years. Objectively measured height and weight shows that the average BMI is 27, that 61% of all respondents are overweight, and that 21% are obese (Table B1).[13] These values are comparable to those for the US population at that time (Burkhauser and Cawley, 2008; Ogden et al., 2014).

The third and fourth category of outcome variables test the robustness of the findings as well as mechanisms. The third category includes *Clinical Diet-Related Objective Health Conditions* which have been found to be associated with an unhealthy unbalanced diet (Niinikoski et al., 1996; American Heart

[13] A person is considered to be overweight if the BMI is between 25 and 30, and obese if it is above 30.

Association, 2001; Pasanisi et al., 2001; Brinkworth et al., 2006; Nagashima et al., 2010; American Heart Association, 2014). The clinical measures are blood pressure (21% hypertension) and blood cholesterol (44% high blood cholesterol).

The fourth category consists of generated measures of respondents' *Unawareness and Medical Check-Up Measures*. Only 25% had their blood pressure taken within the last year, but 44% had their blood cholesterol checked. Fifty-six percent got weighted and 87% received dietary advice within the last year. Contrasting clinical diagnoses and respondents' self-reports, we find that 9% are unaware of their high blood pressure, 29% are unaware of their high cholesterol, and 7% are unaware that they are obese.

Covariates. The covariates can be sub-classified into three main categories: *Demographics*, *Education*, and *Employment*. All mean values are reported in Table B1. Demographics includes the dummy variables *East German*, *Single*, and *Private Health Insurance*, in addition to *Age*, *# Household Members*, and *# Kids*. The second group of covariates includes three educational dummies and the third group seven employment measures, such as *Blue Collar Worker*, *White Collar Worker*, *Unemployed*, or the *Net Household Income* in ten categories.

5.3.2 German National Health Interview and Examination Survey 1998 (GNHIES98)

The second dataset, the *German National Health Interview and Examination Survey 1998* (GNHIES98), is very similar to the *GNHSEW91* described above. In fact, although technically a different dataset, it can be seen as a follow-up survey of the *GNHSEW91* given that most of the questions asked are identical. Consequently, the *GNHIES98* is also a nationwide cross-sectional survey designed to be representative in East and West Germany, with self-reports on food consumption and objective clinical measures and height and weight. More information is provided by the Robert Koch Institut (2012a). The sample used here consists of 2,216 East and 4,203 West Germans. All interviews were carried out between October 1997 and March 1999.

Dependent Variables. We generate categories of dependent variables, analogously to the ones for the *GNHSEW91* above. However, some food-related questions slightly changed. In addition, the retrospective questions on food consumption were no longer asked. The descriptive statistic of all variables are in Table B2 in the Appendix. As above, the first set of dependent variables includes measures on the current consumption of *Meat*, *(boiled) Potatoes*, *Fruits*, *Wholegrain*, *Eggs*, and *Pie*.

A second set of dependent variables includes the exact clinical height, weight, and other diet-related health measures. Analogously to the *GNHSEW91*, we generate the four dummies *Overweight, Obese, High Cholesterol* and *High Blood Pressure*. In addition, we exploit self reported measures on weight gain in the last three years as well as diagnosed diabetes.

Covariates. Because identical or very similar questions were asked in the *GNHIES98* six years later, as Table B2 shows, the list of control variables is selected and generated according to the categorization in the *GNHSEW91*.

5.3.3 German Microcensus 2005

The third and final dataset exploited is the *German Microcensus 2005*. It is a mandatory representative survey of 1% of the German population. Currently 380,000 households with 820,000 respondents participate every year. We make use of the survey year 2005.

The Microcensus helps us to assess the long-term effects of transitioning from life under socialism to capitalism on East German's body mass. In addition, because the Microcensus is compulsory, it minimizes potential non-response or survey participation biases. A final argument for using the Microcensus is that the large number of observations, along with the type of questions asked, allows us to disentangle potential selection effects due to East-West migration. We compare the body mass of individuals who were socialized in the GDR and then migrated to West Germany with those who were socialized in the GDR and stayed in East Germany, and those who were socialized and stayed in West Germany.

Dependent Variables. We use the self-reported weight and height measures to calculate the respondents' BMI. The mean BMI is 25. Almost half of the sample is overweight and 33% are obese (see Table B3 in the Appendix)

To disentangle selection effects due to East-West German migration pattern, we employ two main dummy variables and their interaction. The first variable, *Living in East Germany*, has a value of one for respondents who currently live in one of the six East German states that formerly belonged to the GDR. This applies to 22% or 69,818 respondents (Table B3). The second binary variable, *Educational Degree GDR*, elicits respondents' educational degrees. Educational degrees are surveyed precisely in the Microcensus. Obtaining a GDR educational degree implies that the respondent was socialized in the GDR. Hence they were between the age of 15 and 20 before the Wall came down. 24,584 respondents or 8% of the sample fall into this category.

Covariates. The list of covariates is also in Table B3. We correct the sample composition for factors such as age (mean: 49 years), gender (51% female), labor market status (6.2% unemployed), household composition (62% with partner in household) and marital status (27% single).

6 Testing for Non-Separable Time Preferences in Food Consumption

6.1 Short-Run Post-Reunification Changes in Food Consumption

Using the *GNHSEW91*, the regression framework formalized by equation (20) empirically assesses whether and how East Germans changed their diet in the transition period from socialism to capitalism. The results are reported in Table 2. Panel A reports consumption levels for six select food categories: fresh fruits, cookies and pies, meat, wholegrain bread, boiled potatoes, eggs. The displayed *East German* coefficient identifies differences in consumption between East and West Germans in 1991.

The first three columns of Panel B report *changes* in consumption for three select food categories (fruits, meat, wholegrain) between 1988 and 1991 (Section 5.3.1). As formalized by equation (21), the *East German* coefficient estimate represents changes over time in East Germany relative to West Germany and can thus be interpreted as a difference-in-differences (DiD) estimator.

Novel food. Before the reunification consumption of novel food was negligible in the East (Table 1). For example, in 1989, exotic fruit consumption was basically zero in the East but 1.75 kg/month in the West. The pattern reversed immediately after the reunification, as shown in column (1) of Panel A: The **fresh fruits daily** estimate is large in size (16% of the mean) and highly significant at the 1% level. Column (1) of Panel B—where *changes* in fruit consumption are directly elicited—reinforces this finding. The share of East Germans who increased their fruit consumption between 1988 and 1991 is a significant 16ppt higher as compared to West Germans. Obviously, East Germans consumed fresh exotic fruits at a much higher rate right after the fall of the Wall. This non-monotonic consumption pattern is consistent with the habit formation case in Figure 1, and is formally predicted by Proposition 2.

Familiar food. The *East German* 1991 consumption coefficient for (unprocessed) *potato consumption* is negative, about 10% of the mean and statistically significant (Panel A, column (5)). Potato consumption was three times higher in East Germany in 1989 (Table 1) and obviously sharply declined in the transition phase from socialism to capitalism. Hence consumption patterns of boiled potatoes are consistent with habit formation (Panel B of Figure 2)

[Insert Table 2 about here]

Recall that raw sugar consumption, which mostly includes raw sugar for home-baked pie, was about 30% lower in East Germany before the reunification (Table 1). Moreover, the pre-1989 availability of industrial sweets (not baked at home) was certainly significantly lower in East Germany. However, as seen in column (2) of Panel A, *pie and cookie* consumption was a significant 6.7ppt higher in East Germany in 1991.[14] Hence, it seems reasonable to conclude that pie and cookie consumption increased in East Germany after the reunification, suggesting that pie and cookies feature habit formation (Panel A of Figure 2).

In contrast, we find no evidence that *meat*, *wholegrain* or *egg* (not shown) consumption differed between East and West Germans in 1991, or that it significantly changed in the course of the reunification. In columns (3) and (4) of Panel A, the *East German* coefficients are small in size and not statistically significant. Similarly, in Panel B, the *more meat* and *more wholegrain* DiD coefficients are not statistically significant either. These findings are not inconsistent with our theoretical predictions but one cannot use them to infer whether meat consumption features habit or taste formation.

General Changes in Diet. The last three columns of Panel B directly elicit general dietary changes reported by respondents in 1991. Respondents reported whether they changed their diet in the last three years, and whether they ate more or less food in the last three years. Again, these models can be interpreted as variants of DiD models because the identified coefficients represent the double difference between changes over time for East Germans and changes over time for West Germans (equation (21)).

Interestingly, and in line with the findings above, East Germans were significantly more likely to have changed their diet in the years around the reunification (column (4)): the *East German* DiD coefficient is 13.3ppt (33%) and significant at the one percent level. Column (5) provides an imprecisely estimated DiD coefficient for *More Food* which is, however, large in size (40%). The *Less Food* coefficient is smaller but still of relevant size (22%) and marginally significant. Overall, a significant share of East Germans changed their diet in the transition period from life under socialism to capitalism, where some consumed quantitatively more and some consumed quantitatively less food.

6.2 Short-Run Post-Reunification Changes in Body Weight

Next we study how and whether East Germans' body weight changed in the course of the reunification after they changed their diet. On theoretical grounds, recall that body weight is produced according to

[14] Labeling this food category is somewhat ambiguous because the wording of the survey question potentially allows for familiar as well as for novel food.

$W_t = W(n_t, f_t, \gamma_t, N_t, F_t, Z)$ (equation (3)). The idea is to empirically elicit the sign of the following expression at time t, shortly after the fall of the Wall:

$$\frac{\partial W_t}{\partial p_n} = \frac{\partial W}{\partial n_t}\frac{\partial n_t}{\partial p_n} + \frac{\partial W}{\partial f_t}\frac{\partial f_t}{\partial p_n} + \frac{\partial W}{\partial \gamma_t}\frac{\partial \gamma_t}{\partial p_n} \gtreqless 0 \tag{22}$$

If, after the reunification, novel food consumption increases while familiar food consumption decreases (which is the pattern empirically observed for fruits and potatoes), the effect on body weight is ambiguous. This conclusion holds *a fortiori* when considering changes in physical exercise after the reunification, as represented by the term $\partial\gamma_t/\partial p_n$. Because the overall effect on body weight depends on how caloric input and output adjust after novel food becomes available, the following holds:

Proposition 5. *The impact of novel food on body weight is theoretically ambiguous.*

However, we can address this question empirically. Panel C of Table 2 tests whether, in 1991, East Germans gained and lost weight at a higher rate than West Germans, and whether their weight loss intentions differed (columns (1) to (3)). The findings show indeed that, on average, more East Germans not only changed their diet but also gained weight. The weight gain differential to West Germans is a significant 5.9ppt, or 27%. A similarly high and significant weight loss *intention* differential (6.7ppt or 46%) reinforces the validity of this finding (Panel C, column (3)).

Below, in refined analyses in Section 7, we will link specific quantities of food consumption to weight gains and weight losses (Figures 5 to A4). People who gained weight are those who ate more food, in particular more fat and meat, are overweight and obese, and are planning to lose weight again. Analogously, weight losers ate less food in general, but more wholegrain and fruits, are mostly overweight, and plan to lose even more weight in the future. Interestingly, East German weight gainers were predominantly better educated white-collar men, and East German weight losers were predominantly non-unemployed women (Table B5).

Figure 3a plots the entire BMI distribution for East and West Germans. The unconditional picture strongly suggests that less East Germans had normal weight, and that more East Germans were overweight and obese in 1991. Correcting the BMI distributions for differences in socio-demographics, columns (4) and (5) of Panel C formally test whether East Germans had a higher BMI and whether more East Germans were obese in 1991. Note that these findings are based on objective clinical height and weight measures which were taken by professional health care interviewers. Whereas the average BMI

was only slightly, but significantly, higher among East Germans (0.7 index points), the obesity rate was a substantial 6.7ppt higher.

[Insert Figure 3 about here]

The body mass is determined by the net calorie intake, the difference between input and output. One potential explanation for higher eastern body mass levels is more calorie intake. Another is less physical activity. We test calorie output differences using a detailed physical activity assessment contained in the *GNHSEW91*. Respondents had to estimate their weekly time spent for 20 different physical activities. Summing over all categories, one finds that Germans spend on average 80 minutes per day on physical activities such as hiking, walking or practicing sports. Figure 3b demonstrates that East Germans were *more* physically active than West Germans in 1991. This is confirmed in column (6) of Panel C which shows that the difference amounts to a highly significant 233 minutes per week (33 minutes per day), even after considering differences in socio-demographics. Hence, higher calorie expenditures can not explain the body mass differential between East and West Germans in 1991. If—*ceteris paribus*—physical activity levels had been comparable between the two Germanies, the body mass differentials would have been even larger.

6.3 Medium-Run Dynamics in Food Consumption and Body Weight

Next, we pool the *GNHSEW91* and *GNHIES98* and formally test for consumption dynamics within a regression model as in equation (20). We start with the consumption dynamics for novel food (fruits, cakes, and convenience food) and discuss the dynamics for familiar food afterwards (potatoes, meat, eggs, wholegrain). The $EastGerman_i \times y1998_t$ interaction term in Panel A of Table 3 reports consumption changes for East Germans and specific food categories over time (equation (20)). The plain $EastGerman_i$ estimate yields the consumption differential in 1991. Together with the information on pre-1989 consumption in Table 1, and as derived from our theoretical framework in Section 4, the empirically observed patterns let us infer whether these food products feature habit formation or learning in consumption, and whether time preferences are separable or not. Table 4 provides an overview of the different food types, their consumption dynamics, and whether preferences are separable in time or not.

Novel food. The evidence is very clear for *Fresh Fruits*: consumption increased sharply in the East after 1989, and then remained at the significantly higher level (as compared to West Germany) at least until 1998. This suggests *(a)* that fresh fruits feature habit formation (Proposition 2), and *(b)* that the long-run equilibrium had not been reached by 1998, even nine years after the reunification.

Consumption of a presumably less healthy novel food category, *Pies and Cookies* followed a very similar pattern. It increased in the East after 1989 and remained at a significantly higher level in 1998. Again, these consumption dynamics are consistent with habit formation and persistent novelty effects.

[Insert Table 3 about here]

Convenience Food consumption was only elicited in 1998 in the *GNHIES98*. Processed convenience food—pre-prepared food for home consumption that only needs to be warmed up—was not available in the GDR, but it was available in the West and also marketed in Western television. According to survey data, western households spent €50 per capita per month on it in 1983—a value that increased to €80 in 1993 (Gedrich and Albrecht, 2003). According to the *GNHIES98*, in 1998, 13% of all West Germans consumed processed food once a week but 16% of all East Germans. This differential remains stable, even increases slightly, when considering socio-demographics in the regression framework in column (3) of Panel A. The 4ppt differential is highly significant at the 1% level. Hence, among East Germans, convenience food consumption must have sharply increased after the reunification and was still higher than in West Germany in 1998. This is again consistent with novel food featuring habit formation. As Table 4 shows, the application of our test on intertemporal preferences in food consumption consistently reveals that all novel food types exhibit habit formation in consumption.

Familiar food. When considering familiar food consumption dynamics, only potato consumption underwent significant changes between 1991 and 1998. While consumption was three times as high in 1989 (Table 1), East Germans ate less potatoes than West Germans in 1991, and then eastern potato consumption converged to western levels until 1998. This pattern is again consistent with potatoes featuring habit formation in consumption (Panel B of Figure 2 and Proposition 3), and with the equilibrium being reached between 1991 and 1998.

All other familiar food types—meat, eggs, and wholegrain—show no significant changes between the short- and the medium-run, as if the long-run equilibrium had already been reached by 1991 (Table 4).

6.4 Long-Run Post-Reunification Patterns in BMI

Panel B of Table 3 illustrates that the East-West body weight differential did not further widen between 1991 and 1998. We observe that 5ppt more East Germans gained weight between 1988 and 1991, but

there is no further increase after that (column (1)). Similarly, whereas one finds higher BMI and obesity rates in the East in 1991, the differential seems to neither increase or decrease between 1991 and 1998.

To investigate patterns over an even longer time horizon, we exploit the *Microcensus 2005* and East-West migration pattern: The *Microcensus* elicits in a remarkably precise manner the educational degrees of the respondents, allowing us to clearly identify whether the degrees were earned in the GDR or the FRG prior to 1990. Thus we both identify the respondents' current residency but also their pre-1990 socialization.

[Insert Figure 4 about here]

Figure 4 plots nonparametric BMI distributions by East-West socialization and migration patterns. Respondents living in West Germany without a GDR degree, i.e., 'native' West Germans have the left-most shifted distribution. The next BMI distribution, from left to right, belongs to those who were socialized in the GDR but migrated to West Germany. Note that these migrants are younger, better educated, healthier, and obviously more mobile than East Germans who stayed in East Germany despite having twice as high unemployment rates (Hunt, 2009). It is remarkable that their BMIs seem to exceed those of 'native' West Germans. The BMI distribution that is the most rightward shifted stems from people who socialized in the GDR and stayed there.

Table B4 in the Appendix shows the parametric regression results correcting for socio-demographics and the dependent variables *BMI*, *Overweight*, and *Obesity*. The empirical model is similar to the one in equation (20). The controls are in Table B3.

The highly significant *Living in East Germany* coefficient provides results for people who live in East Germany but did not obtain a GDR degree (due to migration or age). They are 5% more likely to be overweight and 17% more likely to be obese than the reference group of 'native' West Germans. Next, the plain *Educational degree of GDR* coefficient identifies people who were socialized in the GDR and earned their educational degree there. However, sometime between 1989 and 2005, they migrated to West Germany and still live there in 2005. Although they represent a positively selected group—in the sense that they are younger, healthier and better educated—their body mass lies significantly above the body mass of the reference group of West Germans. Their BMI is 0.34 index points higher and they are 8.5% more likely to be overweight and an imprecisely estimated 7% more likely to be obese.

Adding up both the coefficients *Living in East Germany* and *Educational degree of GDR*, as well as their interaction, reveals the body mass for people who were educated in the GDR and still live in East Germany. Their body mass is by far the highest.

7 Mechanisms and Robustness Checks

7.1 Who Changed Their Diet and Gained Weight?

Now we further investigate who changed their diet and gained or lost weight. For this purpose, we run regressions of the three outcome variables *Change In Diet*, *Weight Gain*, and *Weight Loss* on our rich set of socio-demographics. In addition, we interact several socio-demographics with the *East German* dummy in order to assess whether different socio-demographic groups underwent dietary changes in East and West.

Table B5 in the Appendix shows the results and lets us conclude that relatively few socio-demographics and few interaction terms are significantly correlated with the outcome variables. This is the case for *EastGerman*×*Unemployed*, and the sign may be surprising. *A priori* one could have guessed that unemployment in East Germany may be one confounding factor for the reported dietary changes. However, unemployed East Germans were significantly *less* likely to have changed their diet (as were East German singles) and also to lose weight. Moreover, white (and not blue) collar East Germans predominantly gained weight. East German females, by contrast, lost weight at a higher rate after the reunification. All other determinants do not differ by East and West.

Next, we nonparametrically plot the self-reported weight gains and losses in kilograms, along with a set of consumption measures. This exercise also serves as a falsification test to check whether people who reported having gained weight are truly those who ate more and changed their diet. It also double checks the potential for measurement errors, under- or overreporting.

[Insert Figures 5 and 6 about here]

Figure 5 illustrates that weight gain is indeed, almost linearly, associated with *(a)* an increase in food consumption, *(b)* an increase in the body mass index (which crosses the 30 BMI threshold for weight gains of more than 10 kilograms), and *(c)* a strong increase in the intention to lose weight. In addition, one *(d)* fails to find an association with calorie expenditures. This is additional evidence that weight gains result from changes in diet, not changes in caloric expenditures. All four findings reinforce

the validity of the research design and do not yield evidence for significant measurement issues in the self-reported data.

Figure 6 has a similar setup, but the outcomes on the y-axis are *More Fat*, *More Meat*, *More Wholegrain*, and *More Fruit Consumption*. It is easy to observe, intuitively plausible, and reassuring that people who gained weight also consumed more fat and meat, whereas there exists no relationship between weight gain and wholegrain or fruit consumption.

Figures A4 and A3 in the Appendix repeat the exercises above with weight loss. Figure A3 reinforces what we found above and shows that people who lost weight also ate *(a)* less food. Moreover, *(b)* their average body mass falls into the overweight category, but they are not obese, and *(c)* they are planning to lose even more weight. Again, as in the weight gain case, there *(d)* is no relationship between physical activity and weight loss, strongly suggesting that people lost weight due to both a change in diet and because they ate less. The last statement is strongly reinforced by Figure A4 which shows that, in contrast to the weight gainers, weight losers were clearly more likely to eat more whole grain and fruits, but not fat and meat.

7.2 Diet-Related Health Conditions

Table B6 in the Appendix sheds light on the hypothesis that dietary changes and weight gains are reflected in worse diet-related health conditions. Nutritional science has clearly shown that an unbalanced diet leads to higher blood pressure, higher blood cholesterol, and may eventually result in diabetes (Appel et al., 1997; Trayhurn and Beattie, 2001; Mohn et al., 2005; Buettner et al., 2007). The *GNHSEW91* surveyed the objective blood pressure and blood cholesterol levels of the respondents, who were also asked if they were diagnosed with diabetes. The *High Blood Pressure* and *High Cholesterol* dummy variables were constructed according to official medical definitions.

Panel A of Table B6 shows that, in 1991, East Germans were 7ppt more likely to have high blood pressure. Related to a population mean of 0.21, this equals an East-West blood pressure gap of 34%. A similarly large percentage point gap is found for high cholesterol, but since the population prevalence of this condition was 0.44, the East-West gap in percent is only 12%. In contrast, no East-West differential for diabetes can be identified in 1991. Note that diabetes typically develops slowly over time and typically breaks out after years of an unbalanced diet (Trayhurn and Beattie, 2001; Kahn et al., 2009).

7.3 Health Care Access and Awareness About Health Conditions

An interesting question we can tackle is whether East and West Germans with unhealthy diet-related health conditions were aware of their conditions. One possibility is that awareness among East Germans was lower due to institutional barriers and worse access to the health care system. Another possibility is that they were more likely to be unaware since their health condition had recently developed.

Concerning the first hypothesis, one can note that the GDR had a surprisingly well integrated health care system with regular check-ups and a high degree of preventive care (Busse and Riesberg, 2004). This is reflected in Figure A5 (Appendix) where we plot respondents' self-reports about their last check-up by a physician or health care worker. All health care indicators are much better for East Germans: In 1991, they were significantly more likely to have their blood pressure taken (32% vs. 22%, Figure A5a). They were also more likely to have their cholesterol checked (49% vs. 42%, Figure A5b) and their body weight measured (62% vs. 54%, Figure A5c). Lastly, East Germans were more likely to have received dietary advice (although this difference is not statistically significant).

The second hypothesis concerns recent changes in the medical condition, which can possibly explain why a person is unaware of her medical condition. Hence, unawareness in the East would be consistent with the notion that East Germans developed their medical condition only recently, potentially as a result of their recent weight gain. Indeed, Panel B of Table B6 clearly shows that, in 1991, the unawareness levels in East Germany were significantly higher, despite the better health care access. About 7% of East Germans were not aware of their high blood pressure (vs. 3% of West Germans.) As for high cholesterol, the percentage point gap is 18ppt—the unawareness rate among East Germans was almost 40%, while it was below 25% in the West (column (2)). Finally, the obesity unawareness gap between obese East and West Germans was 7ppt, as column (3) shows.[15] It fits nicely that the East-West obesity differential is also 7ppt, and that 6ppt more East Germans gained weight in the transition phase from socialism to capitalism (Panel C of Table 2).

8 Discussion and Conclusion

This work contributes to a growing economic literature aiming to identify the driving forces behind the strong increase in body weight in industrialized countries. One main strand of research exploits narrow, but very cleanly identified, causal impact factors of obesity such as an increased density of fast-food

[15] Note that, theoretically, BMI rates above 30 could also be due to an abnormal level of muscular mass, not body fat (Burkhauser and Cawley, 2008). However, even professional bodybuilders rarely have BMIs above 30 (Biggly.com, 2014).

restaurants, larger portion sizes, or changes in gasoline prices. The identified contributions of these single factors to the overall rise in body weight are, however, typically very small. Another strand of research does not identify causal effects in a reduced form manner, but exploits aggregated data and correlations to theoretically argue that technological change is the main driving force of the obesity epidemic.

This paper bridges both approaches and investigates how the availability of novel food—a characteristic of economic growth and development—can persistently change consumption patterns and body weight. Under socialism, trade opportunities and consumption choices were limited. When the Berlin Wall unexpectedly and suddenly fell, East Germany became a capitalist economy, obtaining immediate access to international markets and free trade. Formerly unavailable western food products became available over night. We develop a theory of novelty consumption that provides preference-based arguments to interpret the changes in food consumption patterns observed after the German reunification.

More specifically, we propose a model where consumers' preferences depend on past consumption experiences. This allows us to explicitly account for the increased variety of new goods—for which they had no consumption experience—among East Germans. We denote such goods as 'novel goods', and we make predictions about consumers' 'novelty consumption', both at the time of the reunification and in subsequent years, when the novelty effect progressively fades away. We show that the corresponding intertemporal consumption dynamics cannot be simply explained by a taste for variety. Moreover, we derive predictions and an empirical test to discriminate whether preferences feature habit or taste formation. One special feature of this empirical test is that representative cross-sectional consumption data are sufficient to carry it out.

When empirically implementing the test, we exploit three different representative datasets for East and West Germany. The data include unique and rich self-reported information on food consumption. Moreover, they contain self-reports on recent body weight changes in addition to objective height and weight and other diet-related health measures. Our empirical findings can be summarized as follows:

First, in the transition period from limited food availability under communism to larger food availability under capitalism, East Germans were significantly more likely to change their diet as compared to West Germans. Although some East Germans ate healthier and lost weight, the majority gained weight. Surprisingly, weight gainers were not the unemployed or blue collar workers, but employed male white collar workers and the better off. Whereas weight gainers consumed more fat and meat, weight losers

consumed more fresh fruits and wholegrain products. Physical activity and calorie expenditures played no relevant confounding role.

Second, digging deeper and assessing the change in consumption of specific food, we find that the consumption patterns for both novel and familiar food reveal habit forming intertemporal preferences. One observes significant increases in the consumption of previously unavailable and unaffordable novel food, such as exotic high-quality food (exotic fruits) or industrial processed food (convenience food). In contrast, one observes sharp immediate decreases in the consumption of cheap staple familiar food (boiled potatoes). Potato consumption rebounded in the medium-run, and then converged quickly to the long-run western equilibrium. Other staple familiar food consumption (meat, eggs, and wholegrain) remained remarkably stable over time, as predicted by the theory. Overall, the application of our theoretical test strongly supports the notion and assumption of habit formation in consumption. It also confirms the existence of non-separable time preferences.

Third, on average, East Germans gained weight after the Wall fell. Their BMI levels and gains in body weight lay significantly above those of West Germans after the reunification. Despite the higher rate of weight loss intentions in the East in 1991, the body mass differential persisted until 1998. This underscores the importance of self-control issues. The East-West BMI gap persisted at least until 2005. We show that even the positively selected group of East Germans who migrated to West Germany were more likely to be overweight than 'native' West Germans.

Our study illustrates in a precise manner how consumption patterns and people's body mass may change when novel food products become available and affordable to the general population. Our theory provides an intertemporal framework and an empirical test that has the power to discriminate between habit and taste formation in consumption. Overall, the theory provides a demand-driven explanation for the obesity epidemic that complements the existing focus on supply-side factors.

References

Abel, A. B. (1990). Asset prices under habit formation and catching up with the Joneses. *American Economic Review*, 38–42.

Alesina, A. and N. Fuchs-Schündeln (2007). Good bye Lenin (or not?): The effect of communism on people's preferences. *American Economic Review 97*(4), 1507–1528.

American Heart Association (2001). *American Heart Association To Your Health! A Guide to Heart-Smart Living*. Clarkson Potter.

American Heart Association (2014). *Understanding Blood Pressure Readings*. http://www.heart.org, last accessed on November 11, 2014.

Anderson, M. L. and D. A. Matsa (2011). Are restaurants really supersizing America? *American Economic Journal: Applied Economics*, 152–188.

Appel, L. J., T. J. Moore, E. Obarzanek, W. M. Vollmer, L. P. Svetkey, F. M. Sacks, G. A. Bray, T. M. Vogt, J. A. Cutler, M. M. Windhauser, et al. (1997). A clinical trial of the effects of dietary patterns on blood pressure. *New England Journal of Medicine 336*(16), 1117–1124.

Attanasio, O. P. and G. Weber (2010). Consumption and saving: Models of intertemporal allocation and their implications for public policy. *Journal of Economic Literature 48*(3), 693–751.

Becker, G. S. and K. M. Murphy (1988). A theory of rational addiction. *Journal of Political Economy 96*(4), 675–700.

Bethlehem, S. (1999). *Heimatvertreibung, DDR-Flucht, Gastarbeiterzuwanderung*. Klett-Cotta, Stuttgart.

Biggly.com (2014). Bodybuilder's body mass index. http://www.biggly.com/bmi.html, last accessed on November 11, 2014.

Blatt, B. (2014). "Unacceptable Ingredients:" How many of the groceries sold at Walmart would be banned by Whole Foods? Slate magazine. http://www.slate.com/articles/life/culturebox/2014/02/whole_foods_and_walmart_how_many_groceries_sold_at_walmart_would_be_banned.html, last accessed at September 28, 2014.

Bleich, S. N., D. Cutler, C. Murray, and A. Adams (2008). Why is the developed world obese? *Annual Review of Public Health 29*(1), 273–295.

Blundell, R. and L. Pistaferri (2003). Income volatility and household consumption: The impact of food assistance programs. *The Journal of Human Resources 38*, pp. 1032–1050.

Bochniak, M. (2009). Katalog der Hausbrandkarten DDR 1950 - 1990. *International Journal of Rationing 1*(2), 43–63.

Böhme, H. (1971). Gebrauchswert und Preispolitik im sozialistischen Wirtschaftssystem. *Weltwirtschaftliches Archiv (Review of World Economics) 106*(1), 78–127.

Bornkessel, S., S. Bröring, and O. S. Omta (2014). Analysing industry convergence in probiotics. mimeo. http://www.berenschot.nl/publish/pages/2174/analysing_industry_convergence_in_probiotics_-_bornkessel_broring_omta.docx., last accessed at September 28, 2014.

Braun, P. A., G. M. Constantinides, and W. E. Ferson (1993). Time nonseparability in aggregate consumption: International evidence. *European Economic Review 37*(5), 897–920.

Brinkworth, G., M. Noakes, J. Buckley, and P. Clifton (2006). Weight loss improves heart rate recovery in overweight and obese men with features of the metabolic syndrome. *American Heart Journal 152*(4), 693.e1–693.e6.

Brosig-Koch, J., C. Helbach, A. Ockenfels, and J. Weimann (2011). Still different after all these years: Solidarity behavior in East and West Germany. *Journal of Public Economics 95*(11), 1373–1376.

Browning, M. and E. Heinesen (2012). Effect of job loss due to plant closure on mortality and hospitalization. *Journal of Health Economics 31*(4), 599–616.

Buettner, R., J. Schälmerich, and L. C. Bollheimer (2007). High-fat diets: Modeling the metabolic disorders of human obesity in rodents. *Obesity 15*(4), 798–808.

Burchardi, K. B. and T. A. Hassan (2013). The economic impact of social ties: Evidence from German reunification. *Quarterly Journal of Economics 128*(3), 1219–1271.

Burda, M. C. (2006). Factor reallocation in eastern Germany after reunification. *American Economic Review 96*(2), 368–374.

Burkhauser, R. V. and J. Cawley (2008). Beyond BMI: The value of more accurate measures of fatness and obesity in social science research. *Journal of Health Economics 27*(2), 519–529.

Bursztyn, L.; Cantoni, D. (2012). A tear in the iron curtain: The impact of Western television on consumption behavior. CEPR Discussion Papers 9101.

Busse, R. and A. Riesberg (2004). *Health care systems in transition: Germany*. WHO Regional Office for Europe on behalf of the European Observatory on Health Systems and Policies.

Carrasco, R., J. M. Labeaga, and J. D. López-Salido (2005). Consumption and habits: Evidence from panel data. *Economic Journal 115*(500), 144–165.

Carroll, C. D. (2000). Solving consumption models with multiplicative habits. *Economics Letters 68*(1), 67–77.

Cawley, J. (2004). The impact of obesity on wages. *Journal of Human Resources 39*(2), 451–474.

Cawley, J., D. Dragone, and S. Von Hinke Kessler Scholder (2015). The demand for cigarettes as derived from the demand for weight loss: A theoretical and empirical investigation. *Health Economics*. forthcoming.

Cawley, J., D. Frisvold, and C. Meyerhoefer (2013). The impact of physical education on obesity among elementary school children. *Journal of Health Economics 32*(4), 743 – 755.

Cawley, J. and C. Meyerhoefer (2012). The medical care costs of obesity: An instrumental variables approach. *Journal of Health Economics 31*(1), 219–230.

Cawley, J., J. A. Rizzo, and K. Haas (2007). Occupation-specific absenteeism costs associated with obesity and morbid obesity. *Journal of Occupational & Environmental Medicine: 49*(12), 1317–1324.

CIA World Factbook (1990). *German Democratic Republic - 1990*. http://www.theodora.com/wfb/1990/index.html, last accessed on December 4, 2013.

Classora Knowledge Base (2014). *Ranking of the World's Richest Countries by GDP (1990)*. http://en.classora.com, last accessed on December 4, 2013.

Collado, M. D. and M. Browning (2007). Habits and heterogeneity in demands: A panel data analysis. *Journal of Applied Econometrics 22*(3), 625–640.

Congressional Research Service (2013). Consumers and food price inflation. CRS Report for Congress. http://fas.org/sgp/crs/misc/R40545.pdf, last accessed on November 15, 2014.

Costa-i Font, J. and N. Mas (2014). 'Globesity'? The Effects of Globalization on Obesity and Caloric Intake. CESifo Working Paper Series 4982.

Courtemanche, C. (2009). Rising cigarette prices and rising obesity: Coincidence or unintended consequence? *Journal of Health Economics 28*(4), 781–798.

Courtemanche, C. (2011). A silver lining? The connection between gasoline prices and obesity. *Economic Inquiry 49*(3), 935–957.

Courtemanche, C., G. Heutel, and P. McAlvanah (2015). Impatience, incentives and obesity. *The Economic Journal 125*(582), 1–31.

Curran, C.-S., S. Bröring, and J. Leker (2010). Anticipating converging industries using publicly available data. *Technological Forecasting and Social Change 77*(3), 385 – 395.

Currie, J., S. DellaVigna, E. Moretti, and V. Pathania (2010). The effect of fast food restaurants on obesity and weight gain. *American Economic Journal: Economic Policy 2*(3), 32–63.

Cutler, D., E. Glaeser, and J. Shapiro (2003). Why have Americans become more obese? *Journal of Economic Perspectives 17*(3), 93–118.

Dodgson, M., D. M. Gann, and N. Phillips (2014). *The Oxford Handbook of Innovation Management* (1 ed.). Oxford University Press. Oxford Handbooks.

Dragone, D. (2009). A rational eating model of binges, diets and obesity. *Journal of Health Economics 28*(4), 799–804.

Dubois, P., R. Griffith, and A. Nevo (2014). Do prices and attributes explain international differences in food purchases? *American Economic Review 104*(3), 832–67.

Dunn, R. A. (2010). The effect of fast-food availability on obesity: An analysis by gender, race, and residential location. *American Journal of Agricultural Economics 92*(4), 1149–1164.

Dynan, K. E. (2000). Habit formation in consumer preferences: Evidence from panel data. *American Economic Review 90*(3), 391–406.

Egger, G., B. Swinburn, and F. Amirul Islam (2012). Economic growth and obesity: An interesting relationship with world-wide implications. *Economics & Human Biology 10*(2), 147–153.

Fisher, J. D., D. S. Johnson, J. Marchand, T. M. Smeeding, and B. B. Torrey (2008). The retirement consumption conundrum: Evidence from a consumption survey. *Economics Letters 99*(3), 482–485.

Fishman, C. (2006). *The Wal-Mart Effect: How the World's Most Powerful Company Really Works–and How It's Transforming the American Economy* (Reprint edition ed.). Penguin Books (Bern).

Fletcher, J. M., D. E. Frisvold, and N. Tefft (2010). The effects of soft drink taxes on child and adolescent consumption and weight outcomes. *Journal of Public Economics 94*(11-12), 967 – 974.

Fontaine, K. R., D. T. Redden, C. Wang, A. O. Westfall, and D. B. Allison (2003). Years of life lost due to obesity. *JAMA 289*(2), 187–193.

Food Marketing Institute (2014a). Food Marketing Industry Speaks, Food Retailing Industry Speaks reports, various years. made available by email request on November 11, 2014.

Food Marketing Institute (2014b). Supermarket Facts: Industry Overview 2013. http://www.fmi.org/research-resources/supermarket-facts,lastaccessedatNovember28,2014.

Friehe, T. and M. Mechtel (2014). Conspicuous consumption and political regimes: Evidence from East and West Germany. *European Economic Review 67*(C), 62–81.

Frijters, P., J. P. Haisken-DeNew, and M. A. Shields (2004a). Investigating the patterns and determinants of life satisfaction in Germany following reunification. *Journal of Human Resources 39*(3), 649–674.

Frijters, P., J. P. Haisken-DeNew, and M. A. Shields (2004b). Money does matter! Evidence from increasing real income and life satisfaction in East Germany following reunification. *American Economic Review 94*(3), 730–740.

Frijters, P., J. P. Haisken-DeNew, and M. A. Shields (2005). The causal effect of income on health: Evidence from German reunification. *Journal of Health Economics 24*(5), 997–1017.

Fuchs-Schündeln, N. (2008). The response of household saving to the large shock of German reunification. *American Economic Review 98*(5), 1798–1828.

Fuchs-Schündeln, N. and P. Masella (2015). Long-lasting effects of socialist education. *Review of Economics and Statistics*. forthcoming.

Fuchs-Schündeln, N. and M. Schündeln (2005). Precautionary savings and self-selection: Evidence from the German reunification experiment. *Quarterly Journal of Economics 120*(3), 1085–1120.

Fuhrer, J. C. (2000). Habit formation in consumption and its implications for monetary-policy models. *American Economic Review 90*(3), 367–390.

Ganter, T. M. (2008). *Searching for a New German Identity* (1 ed.). Peter Lang (Bern). East German Studies/DDR Studien.

Gedrich, K. and M. Albrecht (2003). Datenrecherche der Entwicklung der Haushaltsausgaben für Ernährung in der zweiten Hälfte des 20. Jahrhunderts. Ernährungswende-Materialienband Nr.3, Technische Univ. München, www.ernaehrungswende.de/pdf/MB3%20TUM_final.pdf, last accessed at February 9, 2014.

Grabka, M. M. (2000). Einkommensverteilung in Deutschland: Stärkere Umverteilungseffekte in Ostdeutschland. *DIW Wochenbericht 67*(19), 291–297.

Griffith, R. (2015). Gluttony and sloth? Presidential Lecture EEA 2015 Mannheim, http://personalpages.manchester.ac.uk/staff/rachel.griffith/WorkInProgress/Griffith_MannheimAug2015, last accessed at October 6, 2015.

Griffith, R. and M. O'Connell (2010). Public policy towards food consumption. *Fiscal Studies 31*(4), 481–507.

Griffith, R., M. O'Connell, and K. Smith (2015). Relative prices, consumer preferences, and the demand for food. *Oxford Review of Economic Policy 31*(1), 116–130.

Grossman, M. (1972). On the concept of health capital and the demand for health. *Journal of Political Economy 80*(2), 223–55.

Grossman, M., E. Tekin, and R. Wada (2014). Food prices and body fatness among youths. *Economics & Human Biology 12*(C), 4–19.

Heaton, J. (1993). The interaction between time-nonseparable preferences and time aggregation. *Econometrica 61*(2), 353–385.

Heineck, G. and B. Süssmuth (2013). A different look at Lenin's legacy: Social capital and risk taking in the two Germanies. *Journal of Comparative Economics 41*(3), 789–803.

Henson, C. (2008). The real price of Atlantic salmon. *Sustainable Development Law & Policy 9*, 12.

Hertle, H.-H.; Nooke, M. (2009). *Die Todesopfer an der Berliner Mauer 1961-1989. Ein biographisches Handbuch* (1 ed.). Ch. Links, Berlin.

Hoynes, H. W. and D. W. Schanzenbach (2009). Consumption responses to in-kind transfers: Evidence from the introduction of the Food Stamp Program. *American Economic Journal: Applied Economics 1*(4), 109–39.

Hoynes, H. W. and D. W. Schanzenbach (2012). Work incentives and the Food Stamp Program. *Journal of Public Economics 96*(1), 151–162.

Hsieh, M.-F., P. D. Mitchell, and K. W. Stiegert (2009). Potato demand in an increasingly organic marketplace. *Agribusiness 25*(3), 369–394.

Hunt, J. (2009). Staunching emigration from East Germany: Age and the determinants of migration. *Journal of the European Economic Association 4*(5), 1014–1037.

Jappelli, T. and L. Pistaferri (2010, 09). The consumption response to income changes. *Annual Review of Economics 2*(1), 479–506.

Jeitschko, T. D. and R. A. Pecchenino (2006). Do you want fries with that? An exploration of serving size, social welfare, and our waistlines. *Economic Inquiry 44*(3), 442–450.

Kahn, S. E., R. L. Hull, and K. M. Utzschneider (2009). Mechanisms linking obesity to insulin resistance and type 2 diabetes. *Nature 444*(7121), 840–846.

Kesternich, I., B. Siflinger, J. P. Smith, and J. K. Winter (2014). The effects of World war II on economic and health outcomes across Europe. *Review of Economics and Statistics 96*(1), 103–118.

Kesternich, I., B. Siflinger, J. P. Smith, and J. K. Winter (2015). Individual behavior as a pathway between early-life shocks and adult health: Evidence from hunger episodes in post-war Germany. *The Economic Journal forthcoming*.

Kuismanen, M. and L. Pistaferri (2006). Information, habits, and consumption behavior: Evidence from micro data. Working Paper Series 0572, European Central Bank.

Lakdawalla, D. and T. Philipson (2009). The growth of obesity and technological change. *Economics and Human Biology 7*(3), 283–293.

Lakdawalla, D., T. Philipson, and J. Bhattacharya (2005). Welfare-enhancing technological change and the growth of obesity. *American Economic Review 95*(2), 253–257.

Levy, A. (2002). Rational eating: can it lead to overweightness or underweightness? *Journal of health economics 21*(5), 887–899.

Lindeboom, M., F. Portrait, and G. J. Van den Berg (2010). Long-run effects on longevity of a nutritional shock early in life: The Dutch potato famine of 1846–1847. *Journal of Health Economics 29*(5), 617–629.

Maecker, R. (2013). Preise in der DDR: Warengruppe Lebensmittel (35). http://www.aus-der-ddr.de/preise/lebensmittel.html,lastaccessedatNovember28,2013.

Marcus, J. (2013). The effect of unemployment on the mental health of spouses: Evidence from plant closures in Germany. *Journal of Health Economics 32*(3), 546–558.

Mee, C. L. (1977). *Die Teilung der Beute: Die Potsdamer Konferenz 1945*. Fritz Molden, Muenchen.

Mohn, A., M. Catino, R. Capanna, C. Giannini, M. Marcovecchio, and F. Chiarelli (2005). Increased oxidative stress in prepubertal severely obese children: Effect of a dietary restriction-weight loss program. *The Journal of Clinical Endocrinology & Metabolism 90*(5), 2653–2658.

Nagashima, J., H. Musha, H. Takada, K. Takagi, T. Mita, T. Mochida, T. Yoshihisa, Y. Imagawa, N. Matsumoto, N. Ishige, R. Fujimaki, H. Nakajima, and M. Murayama (2010). Three-month exercise and weight loss program improves heart rate recovery in obese persons along with cardiopulmonary function. *Journal of Cardiology 56*(1), 79–84.

National Heart, Lung, and Blood Institute (1998). Clinical guidelines on the identification, evaluation, and treatment of overweight and obesity in adults: The evidence report. www.ncbi.nlm.nih.gov/books/n/obesity/pdf/, last accessed on November 7, 2014.

Niinikoski, H., J. Viikari, T. Rönnemaa, H. Lapinleimu, E. Jokinen, P. Salo, R. Seppänen, A. Leino, J. Tuominen, I. Välimäki, and O. Simell (1996). Prospective randomized trial of low-saturated-fat, low-cholesterol diet during the first 3 years of life: The strip baby project. *Circulation 94*(6), 1386–1393.

Ogden, C., M. D. Carroll, B. K. Kit, and K. Flegal (2014). Prevalence of childhood and adult obesity in the United States, 2011-2012. *JAMA 311*(8), 806–814.

Overland, J., C. D. Carroll, and D. N. Weil (2000). Saving and growth with habit formation. *American Economic Review 90*(3), 341–355.

Pasanisi, F., F. Contaldo, G. de Simone, and M. Mancini (2001). Benefits of sustained moderate weight loss in obesity. *Nutrition, metabolism, and cardiovascular diseases : NMCD 12*(6), 401–406.

Patent, K. (2013). The difficult relationship between East and West Germans: Examples from ethnological field research. In J. Barkhoff and H. Eberhart (Eds.), *Networking across boarders and frontiers, Grazer Beiträge zur Europäischen Ethnologie*, pp. 141–150. Peter Lang, Frankfurt.

Philipson, T. J. and R. A. Posner (1999). The long-run growth in obesity as a function of technological change. NBER Working Papers 7423.

Puhl, R. M. and C. A. Heuer (2009). The stigma of obesity: A review and update. *Obesity 17*(5), 941–964.

Rainer, H. and T. Siedler (2013). Does democracy foster trust? *Journal of Comparative Economics 37*(2), 251–269.

Robert Koch Institut (2012a). *German National Health Interview and Examination Survey 1998 (GNHIES98), Public Use File*. Robert Koch Institut. http://www.rki.de/EN/Content/Health_Monitoring/HealthSurveys/GNHIES98/GNHIES98_node.html, last accessed on November 11, 2013.

Robert Koch Institut (2012b). *German National Health Survey East-West 1991 (GNHSEW91), Public Use File OW91*. Robert Koch Institut. http://www.rki.de/DE/Content/Gesundheitsmonitoring/PublicUseFiles/informationen_datensaetze/info_datensaetze_node.html, last accessed on November 11, 2013.

Rozen, K. (2010). Foundations of intrinsic habit formation. *Econometrica 78*(4), 1341–1373.

Ruhm, C. J. (2000). Are recessions good for your health? *The Quarterly Journal of Economics 115*(2), 617–650.

Ruhm, C. J. (2005). Healthy living in hard times. *Journal of Health Economics 24*(2), 341–363.

Ruhm, C. J. (2012). Understanding overeating and obesity. *Journal of Health economics 31*(6), 781–796.

Ryder, Harl E, J. and G. M. Heal (1973). Optimum growth with intertemporally dependent preferences. *Review of Economic Studies 40*(1), 1–33.

Sarma, S., G. S. Zaric, M. K. Campbell, and J. Gilliland (2014). The effect of physical activity on adult obesity: Evidence from the Canadian NPHS panel. *Economics & Human Biology 14*(C), 1–21.

Sassi, F. (2010). *Obesity and the Economics of Prevention: Fit not Fat*. OECD Publishing.

Scholte, R., G. J. van den Berg, M. Lindeboom, and D. H. J. Deeg (2014). Does the size of the effect of adverse events at high ages on daily-life physical functioning depend on the economic conditions around birth? IZA Discussion Paper 8075.

Schwarzer, O. (1999). *Sozialistische Zentralplanwirtschaft in der SBZ/DDR. Ergebnisse eines ordnungspolitischen Experiments (1945 - 1989)* (1 ed.). Franz Steiner Verlag.

Sinn, H.-W. (2002). Germany's economic unification: An assessment after ten years. *Review of International Economics 10*(1), 113–128.

Stigler, G. J. and G. S. Becker (1977). De gustibus non est disputandum. *American Economic Review 67*(2), 76–90.

Strulik, H. (2014). A mass phenomenon: The social evolution of obesity. *Journal of Health economics 33*, 113–125.

Sullivan, D. and T. von Wachter (2009). Job displacement and mortality: An analysis using administrative data. *The Quarterly Journal of Economics 124*(3), 1265–1306.

Surwit, R. S., C. M. Kuhn, C. Cochrane, J. A. McCubbin, and M. N. Feinglos (1988). Diet-induced type ii diabetes in C57BL/6J mice. *Diabetes 37*(9), 1163–1167.

Trayhurn, P. and J. H. Beattie (2001, 8). Physiological role of adipose tissue: White adipose tissue as an endocrine and secretory organ. *Proceedings of the Nutrition Society 60*, 329–339.

Uhlig, H. (2006). Regional labor markets, network externalities and migration: The case of German reunification. *American Economic Review 96*(2), 383–387.

United States Census Bureau (1980). Money income in 1978 of households in the United States. Current Population Reports. www2.census.gov/prod2/popscan/p60-121.pdf, last accessed on November 15, 2014.

United States Census Bureau (2014). Income and poverty in the United States: 2013. Current Population Reports. http://www.census.gov/content/dam/Census/library/publications/2014/demo/p60-249.pdf, last accessed on November 15, 2014.

US Food and Drug Administration (2014). *An overview of Atlantic salmon, its natural history, aquaculture, and genetic engineering*. Veterinary Medicine Advisory Committee. http://www.fda.gov/AdvisoryCommittees/CommitteesMeetingMaterials/VeterinaryMedicineAdvisoryCommittee/ucm222635.htm, last accessed on October 4, 2014.

van den Berg, G. J., M. Lindeboom, and F. Portrait (2006). Economic conditions early in life and individual mortality. *American Economic Review 96*(1), 290–302.

van den Berg, G. J., P. R. Pinger, and J. Schoch (2015). Instrumental variable estimation of the causal effect of hunger early in life on health later in life. *Economic Journal forthcoming*.

Wagner, G. G., J. R. Frick, and J. Schupp (2007). The German Socio-Economic Panel Study (SOEP): Scope, evolution, and enhancements. *Journal of Applied Social Science Studies (Schmollers Jahrbuch: Zeitschrift für Wirtschafts- und Sozialwissenschaften) 127*(1), 139–169.

Wagner, G. G. and N. R. Ziebarth (2015). Population attitudes toward doping: The role of personal factors vs. state socialization. mimeo. http://www.human.cornell.edu/pam/people/nicolas_ziebarth.cfm, last accessed on January 29, 2015.

Wakabayashi, K. (2010). Habit formation in natural cheese consumption an approach based on dynamic demand analysis. *Journal of Rural Economics 82*(1), 1–10.

Woll, E. (2012). *Wer Schreibt, Der Bleibt: Erinnerungen ab der 1930er Jahre* (1 ed.). Norderstedt Books.

World Health Organization (2015). Fact sheet 311: Obesity and overweight. Technical report. http://www.who.int/mediacentre/factsheets/fs311/en/lastaccessed28January2015.

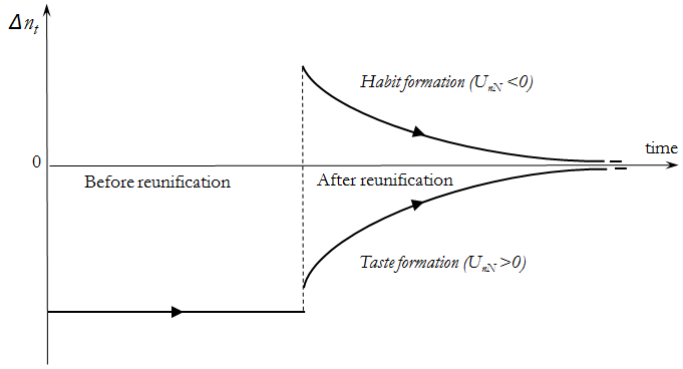
World Intellectual Property Organization (WIPO) (2014). *WIPO IP Statistics Data Center*. http://ipstats.wipo.int/ipstatv2/index.htm, last accessed on October 4, 2014.

Zentralverwaltung für Statistik der DDR (1988). *Statistisches Jahrbuch der Deutschen Demokratischen Republik - 1987* (1 ed.). Staatsverlag der Deutschen Demokratischen Republik.

Zentralverwaltung für Statistik der DDR (1990). *Statistisches Jahrbuch der Deutschen Demokratischen Republik - 1990* (1 ed.). Staatsverlag der Deutschen Demokratischen Republik.

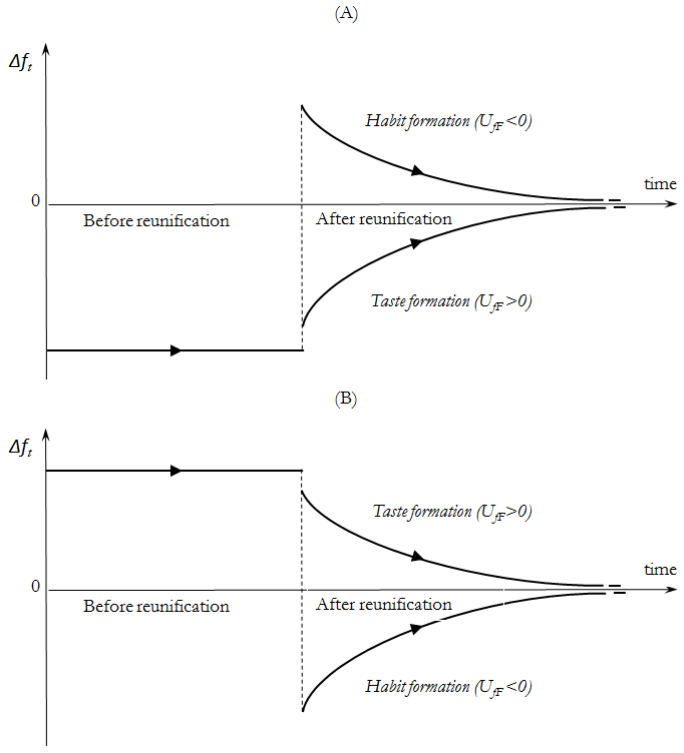
Zentralverwaltung für Statistik der DDR (1991). *Statistisches Jahrbuch der Deutschen Demokratischen Republik - 1991* (1 ed.). Staatsverlag der Deutschen Demokratischen Republik.

Figure 1: East-West Difference in Novel Food Consumption Before and After the Reunification



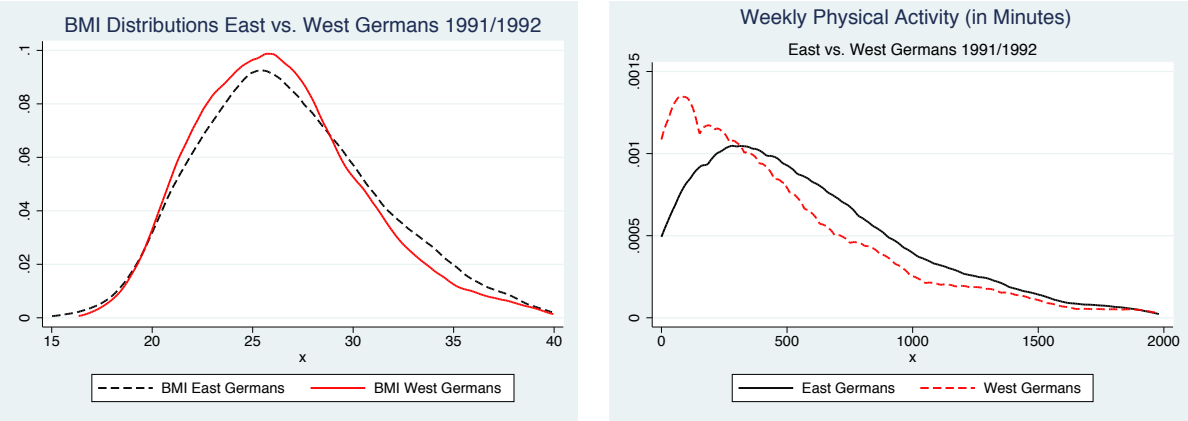
Note: Novel food consumption is zero in East Germany before the reunification. After the reunification, the consumption differential to West Germany is positive if novel food is habit forming, and negative if it is taste forming. In the long-run, the differential vanishes.

Figure 2: East-West Difference in Familiar Food Consumption Before and After the Reunification



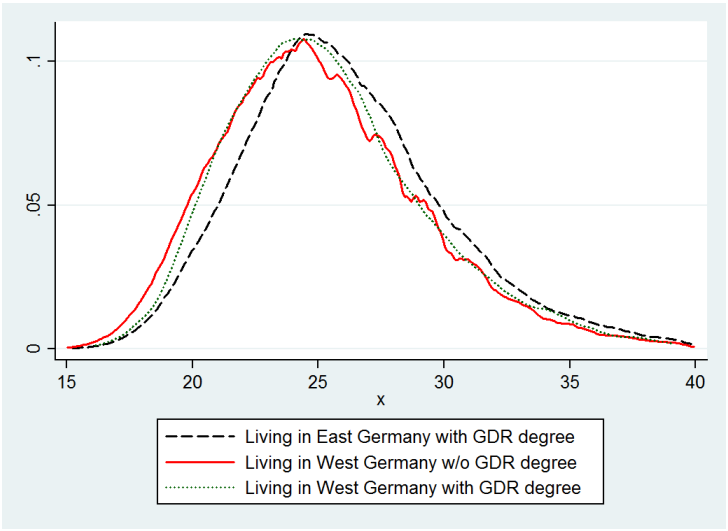
Note: Panel A represents the case where familiar food consumption is lower in East than in West Germany before the the reunification (e.g. sugar and eggs). Panel B represents the opposite case (e.g. potatoes). Empirically observing East-West consumption differences before and after the reunification allows to infer whether familiar food is habit or taste forming.

Figure 3: Distributions of (a) BMI (Objective Measures), (b) Minutes of Physical Activity in 1991/1992



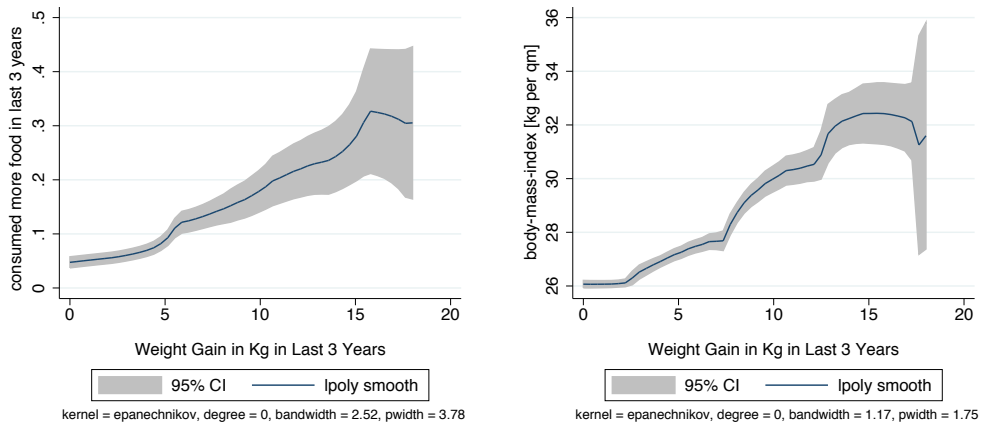
Source: Robert Koch Institut (2012b), German National Health Survey East-West 1991 (*GNHSEW91*)

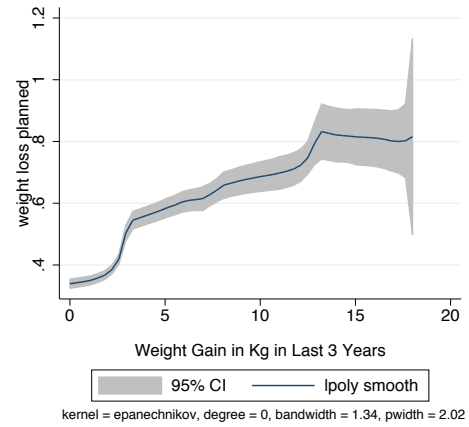
Figure 4: East-West BMI Distributions 2005, Disentangled by East-West Migration

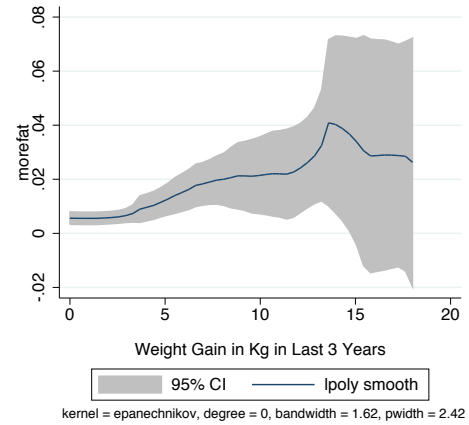


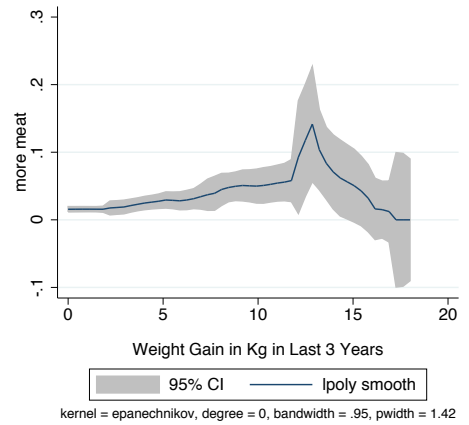
Source: German Microcensus 2005

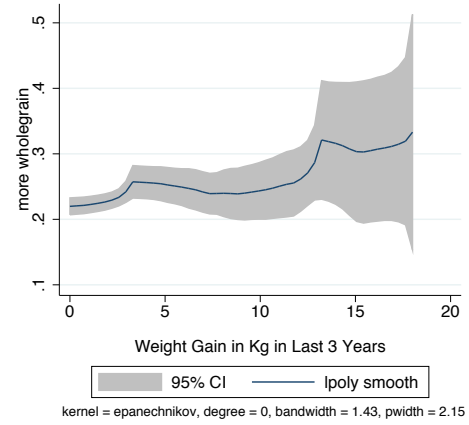
Figure 5: Weight Gain and (a) More Food Consumption, (b) BMI, (c) Weight Loss Planned, (d) Physical Activity (1991/1992)











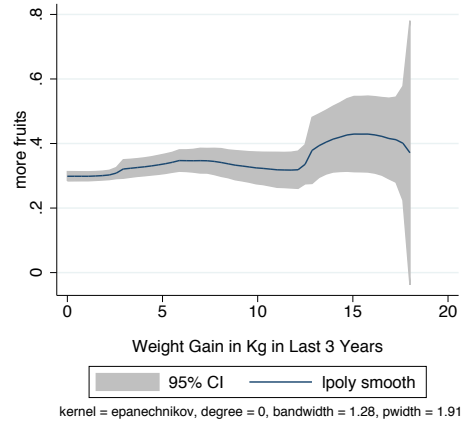


Figure 6: Weight Gain and More Consumption of (a) Fat, (b) Meat, (c) Fruit, (d) Wholegrain (1991/1992)

Table 1: Pre-Reunification Monthly per Capita Consumption and Prices of Selected Food Categories

Food Category	***GDR/East Germany (1989)***			***FRG/West Germany (1988)***		
	Consumption per month *(in kg)* (1)	**Price per kg *(in 2000 €)* (2)**	**Price per kg *(in % of net HH income)* (3)**	**Consumption per month *(in kg)* (4)**	**Price per kg *(in 2000 €)* (5)**	**Price per kg *(in % of net HH Income)* (6)**
Potatoes	*9.7*	0.11	0.02%	*3.03*	0.6	0.04%
Meat	*5.25*	5.19 (pork chop)	0.8%	*4.49*	6.63	0.5%
Eggs	*25.4* eggs	0.22	0.03%	*31*	0.13	0.01%
Sugar	*1.18*	1.00	0.15%	*1.56*	1.10	0.08%
Exotic fruits	*0 (N/A)*	11.67 (pineapple can)	1.8%	*1.75*	1.59	0.1%

Source: Böhme (1971); Zentralverwaltung für Statistik der DDR (1988, 1990, 1991); Schwarzer (1999); Grabka (2000); Gedrich and Albrecht (2003); Woll (2012); Maecker (2013), own calculations and illustrations. Consumption is per capita and month. GDR net household income is taken from Zentralverwaltung für Statistik der DDR (1991) and refers to a one-person household in 1988. FRG household income is taken from Grabka (2000) and refers to equivalent disposable household income according to the SOEP in 1988 and 1997 (in 1995 prices). Food prices are taken from Zentralverwaltung für Statistik der DDR (1988, 1990); Gedrich and Albrecht (2003); Woll (2012); Maecker (2013). Time values of prices and income have been adjusted assuming an inflation rate of 2%, an East-West German exchange rate of 1:1 and a €-DM exchange rate of 1:1.95883. One kilogram (kg) equals 2.2 pounds (lbs).

Table 2: Short-Run Post-Reunification Changes in Food Consumption and Body Weight (1991/1992)

Panel A: Current diet						
	fresh fruits daily (1)	**pie regularly (2)**	**meat weekly (3)**	**wholegrain bread daily (4)**	**(boiled) potatoes daily (5)**	**eggs regularly (6)**
East German	0.0928***	0.0671**	0.0280	-0.0053	-0.0266**	0.0248
	(0.0313)	(0.0319)	(0.0285)	(0.0331)	(0.0282)	(0.0277)
mean	0.57	0.36	0.74	0.54	0.26	0.23
Δ	16%	19%	4%	-1%	-10%	11%
Panel B: Change in diet, last 3 years						
	more fruits (1)	**more meat (2)**	**more whole-grain(3)**	**change in diet (4)**	**more food (5)**	**less food (6)**
East German	0.1622***	0.0251	0.0105	0.1330***	0.0111	0.0472*
	(0.0310)	(0.0288)	(0.0096)	(0.0323)	(0.0109)	(0.0266)
mean	0.34	0.02	0.25	0.40	0.028	0.21
Δ (coefficient/mean)	48%	52%	10%	33%	40%	22%
Panel C: Change and differences in body mass						
	weight gain (1)	**weight loss (2)**	**weight loss planned (3)**	**BMI (4)**	**obese (5)**	**minutes active (6)**
East German	0.0589**	0.0072	0.0676**	0.6838**	0.0668**	232.79***
	(0.0295)	(0.0240)	(0.0330)	(0.2909)	(0.0262)	(37.7708)
mean	0.27	0.15	0.46	27.7	0.21	560
Δ (coefficient/mean)	22%	5%	15%	2%	33%	42%

Source: Robert Koch Institut (2012b), German National Health Survey East-West 1991 (GNHSEW91), own calculations and illustrations; * p<0.1, ** p<0.05, *** p<0.01; standard errors in parentheses. The descriptive statistics are in the Appendix (Table B1). Each column in each panel represents one model, estimated by OLS, with the dependent variable in the column header and the independent variables as listed in Table B1. In Panel A and B, all self-reported dependent variables are dummy variables. The original questions have more than two answer categories: Panel A: *(i)* daily, *(ii)* several times a week, *(iii)* once a week, *(iv)* 2-3 times a month, *(v)* once a month, *(vi)* never. We collapse these categories as follows: 'Regularly' refers to consumption 'several times a week or daily', i.e., (i) and (ii). The questions exploited in Panel B, columns (1) to (3), have answer categories *(i)* more, *(ii)* same, *(iii)* less [consumption of food category X in last 3 years]. Panel B, columns (4) to (6) exploit whether respondents changed their diet, and consumed overall more or less food. Panel C, columns (1) to (3), are based on self-reports about weight gains or losses in the last 3 years as well as planned weight losses. Columns (4) and (5) of Panel C are based on objective height and weight measures, and column (6) sums over the amount of hours and minutes typically spent per week for 20 different physical activities. Section 5.3 provides more information on the variables. The number of observations for all columns and panels is 6,550. The R-squared in Panel A lies between 0.02 (column (5)) and 0.11 (column (2)), in Panel B it lies between 0.01 (column (4)) and 0.04 (column (6)) and in Panel C between 0.05 (column (6)) and 0.16 (column (4)). The "mean" refers to the mean of the dependent variable in the column header.

Table 3: Medium-Run Dynamics in Food Consumption and Body Weight (between 1991 and 1998)

Panel A: Diet	**fresh fruits daily (1)**	**pie regularly (2)**	**convenience food weekly (3)**	**meat weekly (4)**	**(boiled) potatoes daily (5)**
East German×1998	0.0219	-0.0385	0.0385***	-0.0046	0.1067***
	(0.0290)	(0.0298)	(0.0104)	(0.0266)	(0.0254)
East German	0.1157***	0.0610**		0.0233	-0.0602***
	(0.0254)	(0.0260)		(0.0232)	(0.0222)
mean	0.58	0.22	0.14	0.74	0.48
Panel B: Body Mass	**weight gain (1)**	**BMI (2)**	**obese (3)**		
East German×1998	-0.0410	0.0620	-0.0165		
	(0.0281)	(0.2674)	(0.0243)		
East German	0.0477*	0.3094	0.0451**		
	(0.0245)	(0.2338)	(0.0212)		
mean	0.30	26.7	0.21		

Source: Robert Koch Institut (2012b,a), German National Health Survey East-West 1991 (GNHSEW91) and German National Health Interview and Examination Survey 1998 (GNHIES98) pooled, own calculations and illustrations; * p<0.1, ** p<0.05, *** p<0.01; standard errors in parentheses. The descriptive statistics are in the Appendix (Table B1 and B2). Each column in each panel represents one model, estimated by OLS, with the dependent variable in the column header. More details on the dependent variables can be found in Tables 2 and B6 as well as in Section 5.3. The control variables used are listed in Table B1 and B2. The number of observations for all columns and panels is 12,969, except for column (3) in Panel A that is only based on the 1998 data (6,419 obs.). The 'mean' refers to the mean of the dependent variable in the column header.

Table 4: Does Food Feature Habit Formation or Learning in Consumption?

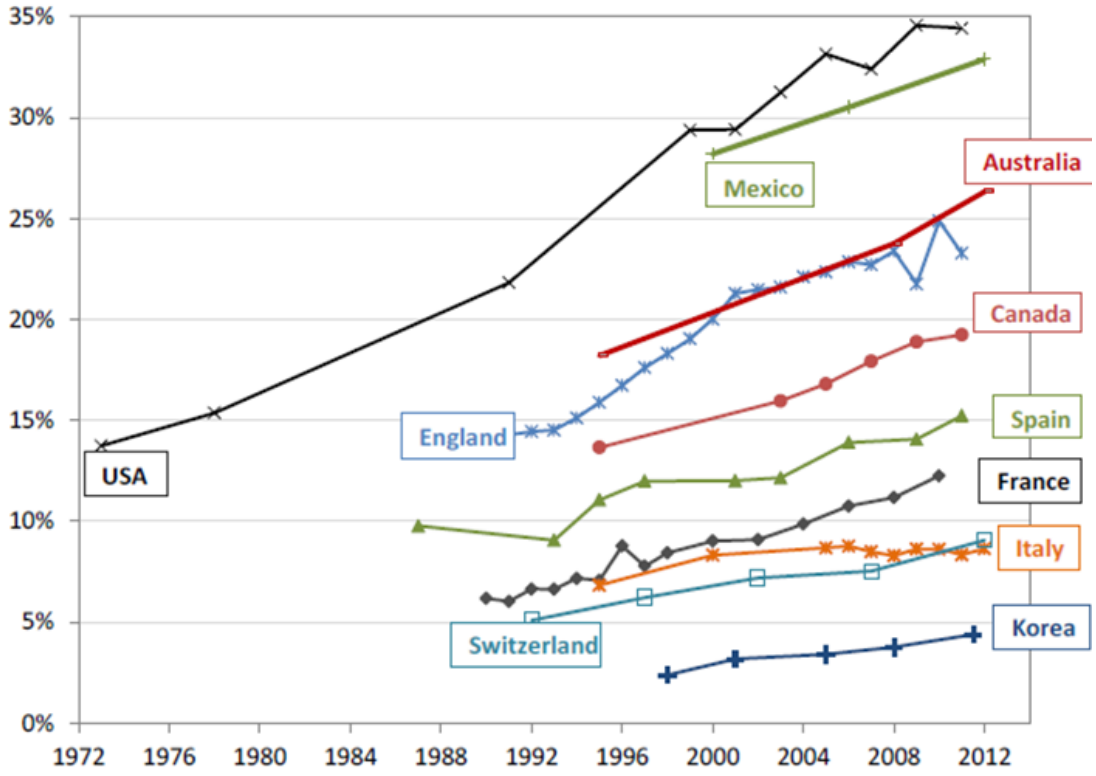
	Pre-1989 to 1991	**1991 to 1998**	**Consumption Dynamics**	**Inference from Theory**
Panel A: Novel Food				
Fresh fruit	sharp increase in East	higher level in East	sharp increase	habit formation
Pies and cookies	increase in East	higher level in East	increase	habit formation
Convenience food	N/A (likely sharp increase)	higher level in East	sharp increase	habit formation
Panel B: Familiar Food				
Meat	same in East and West	same in East and West	flat, no changes	N/A
Boiled potatoes	sharp decline in East	rebound to West equilibrium	decrease, then increase to long-run West equilibrium	habit formation
Wholegrain	same in East and West (in 1991)	N/A	flat, no changes	N/A
Eggs	same in East and West	same in East and West	flat, no changes	N/A

Own illustration derived from from empirical and theoretical models. Note that 'pies and cookies' can also be familiar food; however many industrially produced products fall into this category and thus many newly available western pie and cookie products entered the eastern market after the fall of the Wall.

For Online Publication

Appendix A: Figures

Figure A1: Development of obesity rates in OECD countries

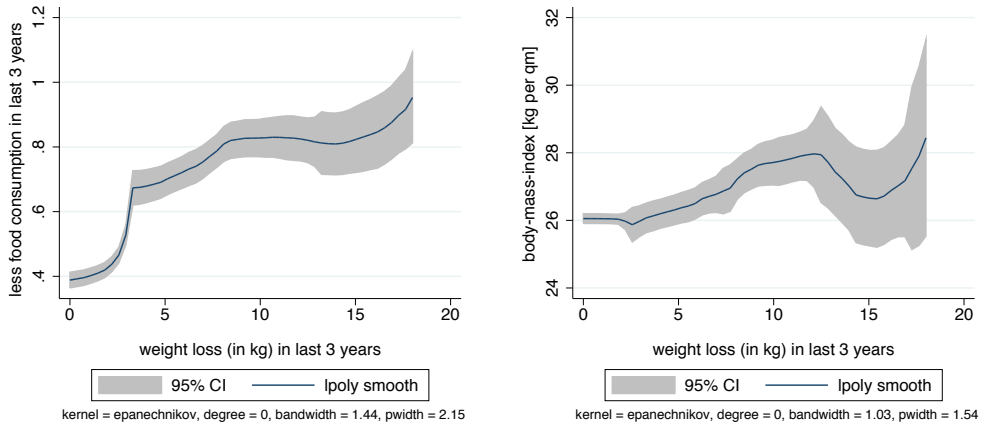


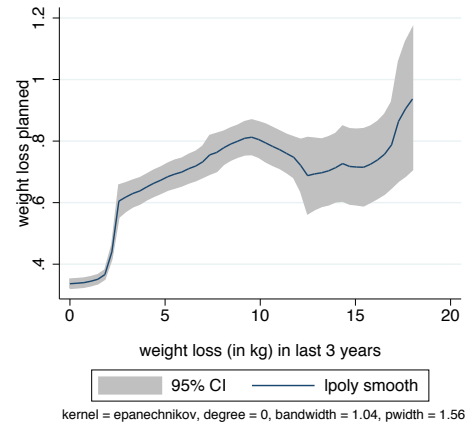
Source: OECD, 2014

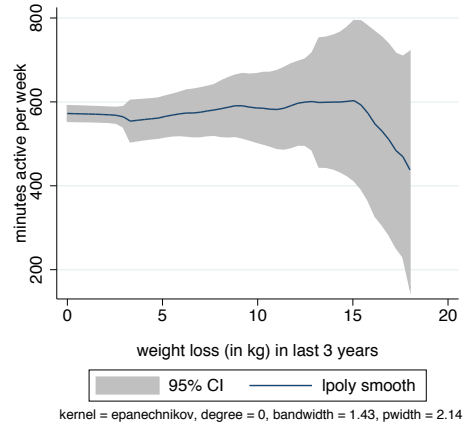
Figure A2: Division of Germany, 1961

Source: IEG-Maps, Institute of European History, Mainz; available at http://germanhistorydocs.ghi-dc.org/, last accessed on March 6, 2013.

Figure A3: Weight Loss and (a) Less Food Consumption, (b) BMI, (c) Weight Loss Planned, and (d) Physical Activity (1991/1992)







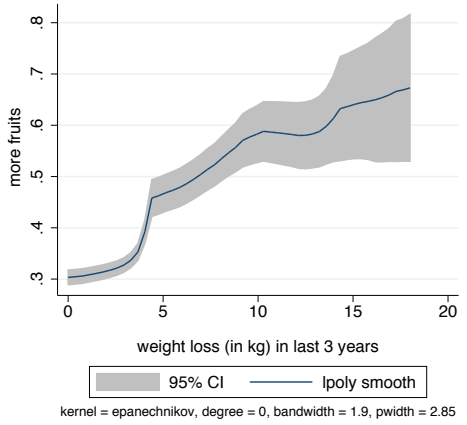
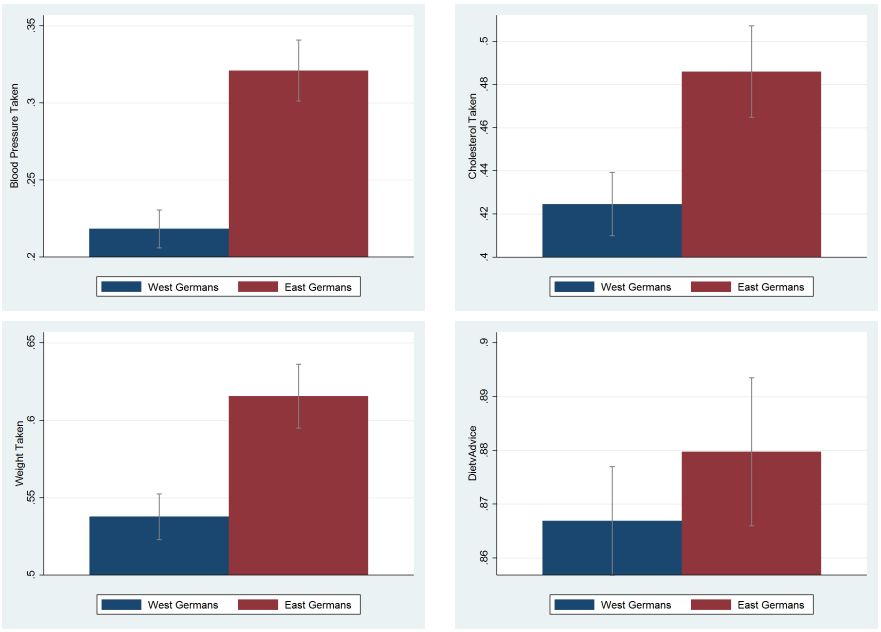


Figure A4: Weight Loss and More Consumption of (a) Fat, (b) Meat, (c) Fruit, (d) Wholegrain (1991/1992)

Figure A5: East-West Differences in (a) Blood Pressure Taken, (b) Cholesterol Measured, (c) Weighted, and (d) Dietary Advice by Health Care Worker in Last Year (1991/1992)



Appendix B: Tables

Table B1: Descriptive Statistics German National Health Survey East-West 1991 (*GNHSEW91*)

Variable	Mean	Std. Dev.	Min.	Max.	N
A. Outcome Measures					
Current diet					
Meat weekly	0.7447	0.436	0	1	6,550
Boiled potatoes daily	0.2557	0.4363	0	1	6,550
Fresh fruits daily	0.5759	0.4942	0	1	6,550
Wholegrain bread daily	0.5359	0.4987	0	1	6,550
Eggs regularly (more than once a week)	0.2252	0.4177	0	1	6,550
Pies and cookies (more than once a week)	0.3602	0.4801	0	1	6,550
Change in diet and body mass, last 3 years					
More meat (at least once a week)	0.0211	0.1436	0	1	6,550
More fresh fruits	0.3385	0.4732	0	1	6,550
More wholegrain	0.2544	0.4355	0	1	6,550
Change in diet	0.4044	0.4908	0	1	6,550
More food	0.0276	0.1639	0	1	6,550
Less food	0.2055	0.4041	0	1	6,550
Weight gain	0.2681	0.4430	0	1	6,550
Weight gain (in kg)	1.96	3.84	0	65	5,454
Weight loss	0.2681	0.4430	0	1	6,550
Weight loss (in kg)	1.45	3.79	0	91	4,682
Weight loss planned	0.4586	0.4983	0	1	6,550
Body-mass-index [kg pro qm]	26.6839	4.6293	15.02	75.467	6,550
Overweight (BMI>25)	0.6099	0.4878	0	1	6,550
Obese (BMI>30)	0.2053	0.404	0	1	6,550
Minutes active per week	559.94	572.65	0	6780	6,550
Diet-related objective health conditions					
Total blood cholesterol [>6.2 mmol/l]	6.1306	1.2287	2.33	12.9	6,550
High total blood cholesterol [>6.2 mmol/l]	0.4407	0.4965	0	1	6,550
Hypertension	0.2108	0.4079	0	1	6,550
Diabetes (self-reported)	0.0466	0.2107	0	1	6,550
Unawareness and medical check-up measures					
Blood pressure taken in last year	0.2522	0.4343	0	1	6,550
Cholesterol taken in last year	0.4448	0.4969	0	1	6,550
Weight taken in last year	0.5634	0.4959	0	1	6,550
Dietary advice in last year	0.8711	0.3350	0	1	6,550
Unaware hypertension	0.0936	0.2912	0	1	6,550
Unaware high cholesterol	0.2946	0.4559	0	1	6,550
Unaware obese	0.0748	0.2631	0	1	6,550
B. Covariates					
Demographics					
East German	0.3298	0.4702	0	1	6,550
Age	44.9421	12.626	25	69	6,550
Female	0.5116	0.4999	0	1	6,550
# household members	2.838	1.2246	1	18	6,550

Continued on next page...

... table B1 continued

Variable	Mean	Std. Dev.	Min.	Max.	N
# own kids	1.6313	1.2717	0	9	6,550
Single	0.1435	0.3506	0	1	6,550
Private health insurance	0.0933	0.2909	0	1	6,550
Education					
8 school years	0.5379	0.4986	0	1	6,550
10 school years	0.2708	0.4444	0	1	6,550
13 school years	0.1644	0.3707	0	1	6,550
Employment					
Physical work	0.1179	0.3225	0	1	6,550
Blue collar worker	0.4107	0.4920	0	1	6,550
White collar worker	0.4209	0.4937	0	1	6,550
Civil servant	0.0609	0.2392	0	1	6,550
Trained for job	0.4496	0.4975	0	1	6,550
Unemployed	0.0484	0.2146	0	1	6,550
Net household income in DM (10 categories)	5.1685	2.3833	1	10	6,550

Sources: Robert Koch Institut (2012b), German National Health Survey East-West 1991 (*GNHSEW91*)

Table B2: German National Health Interview and Examination Survey 1998 (GNHIES98)

Variable	Mean	Std. Dev.	Min.	Max.	N
A. Outcome Measures					
Current diet					
Meat weekly (at least once a week)	0.7267	0.4456	0	1	6,419
Boiled Potatoes daily	0.219	0.4136	0	1	6,419
Fresh fruits fruits daily	0.5788	0.4938	0	1	6,419
Wholegrain bread daily	0.4161	0.4930	0	1	6,419
Eggs regularly (more than once a week)	0.2074	0.4054	0	1	6,419
Pies and cookies regularly (more than once a week)	0.3912	0.4881	0	1	6,419
Convenience food weekly (at least once a week)	0.1436	0.3507	0	1	6,419
Clinical objective health measures					
Weight gain (in last 3 yrs., self-reported)	0.3349	0.472	0	1	6,419
Overweight (BMI>25)	0.6007	0.4898	0	1	6,419
Obese (BMI>30)	0.2083	0.4061	0	1	6,419
High total cholesterol [>6.2 mmol/l]	6.0046	1.2631	2.01	16.8	6,419
High blood pressure	0.2359	0.4246	0	1	6,419
Diabetes (self-reported)	0.0514	0.2208	0	1	6,419
B. Covariates					
Demographics					
East German	0.3452	0.4755	0	1	6,419
Age	45.3317	15.6451	17	79	6,419
Female	0.5097	0.4999	0	1	6,419
# household members	2.8032	1.2756	1	12	6,419
# own kids	0.5921	0.9276	0	9	6,419
Single	0.2228	0.4161	0	1	6,419
Private health insurance	0.0469	0.2114	0	1	6,419
Education					
8 school years	0.3991	0.4898	0	1	6,419
10 school years	0.1905	0.3927	0	1	6,419
13 school years	0.3664	0.4819	0	1	6,419
Employment					
Physical work	0.2276	0.4193	0	1	6,419
Blue collar worker	0.3332	0.4714	0	1	6,419
White collar worker	0.4102	0.4919	0	1	6,419
Civil servant	0.0495	0.217	0	1	6,419
Unemployed	0.2898	0.4537	0	1	6,419
Net household income in DM (13 categories)	6.6235	2.9263	1	13	6,419

Sources: Robert Koch Institut (2012a), German National Health Interview and Examination Survey 1998

Table B3: German Microcensus 2005

Variable	Mean	Std. Dev.	Min.	Max.	N
A. Outcome Measures					
BMI	25.3578	4.375	7.4651	82.1828	312,983
Overweight	0.4814	0.4997	0	1	312,983
Obese	0.132	0.3385	0	1	312,983
B. Covariates					
Socialized in GDR vs. living in East Germany					
Living in East Germany	0.2231	0.4163	0	1	312,983
Educational degree of GDR	0.0785	0.269	0	1	312,983
Living in East Germany×GDRdegree	0.0688	0.2531	0	1	312,983
Demographics					
Age	49.1783	18.6993	16	95	312983
Female	0.513	0.4998	0	1	312983
Unemployed	0.0629	0.2429	0	1	312983
Partner in household	0.6205	0.4853	0	1	312983
Single	0.2666	0.4422	0	1	312983

Sources: German Microcensus 2005, own illustration

Table B4: Long-Run Post-Reunification Patterns in Body Weight (2005)

Food Category	*BMI*			*overweight*			*obese*		
	(1)	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**	**(7)**	**(8)**	**(9)**
Living in East Germany	0.4217***		0.2660***	0.0411***		0.0253***	0.0260***		0.0224***
	(0.0177)		(0.0206)	(0.0020)		(0.0024)	(0.0014)		(0.0017)
Educational degree of GDR		0.6620***	0.1736**		0.0647***	0.0107		0.0268***	0.0023
		(0.0276)	(0.0748)		(0.0032)	(0.0086)		(0.0022)	(0.0061)
EastGermany×GDRdegree			0.3414***			0.0411***			0.0097
			(0.0821)			(0.0094)			(0.0067)
Constant	23.3873***	23.3725***	23.3560***	0.2700***	0.2685***	0.2670***	0.0410***	0.0418***	0.0403***
	(0.0365)	(0.0366)	(0.0366)	(0.0042)	(0.0042)	(0.0042)	(0.0030)	(0.0030)	(0.0030)
Socio-demographic controls	yes	yes	yes	yes	yes	yes	yes	yes	yes
Observations	312,983	312,983	312,983	312,983	312,983	312,983	312,983	312,983	312,983
R-squared	0.1184	0.1185	0.1191	0.1168	0.1168	0.1173	0.0229	0.0223	0.0229

Source: Microcensus2005, own calculations and illustrations; * p<0.1, ** p<0.05, *** p<0.01; standard errors in parentheses. The descriptive statistics are in the Appendix (Table B3). Each column in each panel represents one model, estimated by OLS, with the dependent variables in the column header. More details on the dependent body mass variables and the covariates employed can be found in Table B3 and in Section 5.3. The constant identifies the body mass of West Germans who live in West Germany with zeros on all covariates considered (see Table B3). Adding the *Living in East Germany* coefficient yields the body mass for people living currently in East Germany but without a GDR educational degree (e.g., due to age or migration to East Germany). Adding all four coefficients yields the body mass for people living in East Germany with a GDR educational degree. And just adding the *Educational degree of GDR* coefficient yields the body mass for people who were socialized in the former GDR but migrated to West Germany where they currently live.

Table B5: Who Changed their Diet, Gained and Lost Weight Shortly after the Reunification?

Variable	change diet (1)	weight gain (2)	weight loss (3)
Personal characteristics			
East German	0.0815	0.1243	0.0134
	(0.1067)	(0.0975)	(0.0792)
Agegroup2	0.0131	-0.0084	-0.0179
	(0.0192)	(0.0175)	(0.0142)
Agegroup3	0.0167	-0.0663***	-0.0107
	(0.0260)	(0.0238)	(0.0193)
East German×Agegroup2	-0.0291	0.0023	-0.0047
	(0.0332)	(0.0304)	(0.0247)
East German×Agegroup2	-0.0535	0.0195	0.0413
	(0.0463)	(0.0423)	(0.0343)
Female	0.0935***	0.0813***	-0.0048
	(0.0155)	(0.0141)	(0.0115)
East German×Female	0.0138	-0.0135	0.0346*
	(0.0267)	(0.0244)	(0.0198)
Single	0.0236	0.0074	-0.0111
	(0.0231)	(0.0211)	(0.0172)
East German×Single	-0.0903**	0.0174	0.0020
	(0.0423)	(0.0387)	(0.0314)
Household net income	0.0027	0.0108***	-0.0021
	(0.0036)	(0.0033)	(0.0026)
East German×HHNetIncome	0.0114	0.0055	-0.0044
	(0.0072)	(0.0066)	(0.0053)
Educational characteristics			
8 years of completed schooling	0.0876**	0.0736*	0.0308
	(0.0441)	(0.0403)	(0.0328)
East German×8SchoolYrs.	-0.0250	-0.0275	0.0068
	(0.0836)	(0.0764)	(0.0621)
10 years of completed schooling	0.1467***	0.0761*	0.0484
	(0.0470)	(0.0430)	(0.0350)
East German×10SchoolYrs.	-0.0343	-0.0605	-0.0194
	(0.0862)	(0.0788)	(0.0640)
13 years of completed schooling	0.1687***	0.0838*	0.0263
	(0.0484)	(0.0442)	(0.0360)
East German×13SchoolYrs.	-0.0392	-0.0842	0.0095
	(0.0911)	(0.0832)	(0.0676)
Job characteristics			
Blue Collar Worker	0.0058	0.0408*	0.0293
	(0.0247)	(0.0226)	(0.0183)
East German×BlueCollar	0.0669	-0.0740*	-0.0068
	(0.0491)	(0.0448)	(0.0364)
White Collar Worker	0.0162	0.0110	0.0182
	(0.0238)	(0.0217)	(0.0176)
East German×WhiteCollar	0.0884*	-0.0298	0.0049
	(0.0477)	(0.0436)	(0.0354)
Unemployed	0.1462***	-0.0026	0.0666*
	(0.0484)	(0.0443)	(0.0361)
East German×Unemployed	-0.1068*	0.0561	-0.0909**
	(0.0605)	(0.0552)	(0.0450)

Source: Robert Koch Institut (2012b), German National Health Survey East-West 1991 (*GNHSEW91*), own calculation and illustration; * p<0.1, ** p<0.05, *** p<0.01; standard errors in parentheses. The descriptive statistics are in the Appendix (Table B1). The model is estimated by OLS; the three binary outcome variables are one if respondents indicate to have changed their diet (column (1)), gained weight (column (2)) or lost weight (column (3)) in the last three years. For more information on how the variables were generated, see Section 5.3.1. Not displayed, non-significant, additional control variables and their interactions with *East German* are: # household members, # own kids, private health insurance, civil servant, trained for job, physical work, month fixed effects, and year fixed effects. The number of observations is 6,550 and the R-squared lies between 4 (columns (1)) and 0.7 (column (3)).

Table B6: Short-Run Post-Reunification Changes in Diet-Related Health and Awareness about Medical Conditions (1991/1992)

Panel A: Clinical objective diet-related health conditions

	High blood pressure (1)	**High cholesterol (2)**	**Diabetes (3)**
East German	0.0716***	0.0524*	0.0028
	(0.0258)	(0.0310)	(0.0138)
mean	0.21	0.44	0.046
Δ (coefficient/mean)	34%	12%	6.5%

Panel B: Unawareness of hypertension, high cholesterol, and obesity

	Unaware high blood pressure (1)	**Unaware high cholesterol (2)**	**Unaware obese (3)**
East German	0.0619***	0.1813***	0.0739***
	(0.0191)	(0.0296)	(0.0173)
mean	0.09	0.29	0.07
Δ (coefficient/mean)	69%	63%	100%

Source: Robert Koch Institut (2012b), German National Health Survey East-West 1991 (GNHSEW91), own calculations and illustrations; * p<0.1, ** p<0.05, *** p<0.01; standard errors in parentheses. The descriptive statistics are in the Appendix (Table B1). Each column in each panel represents one model, estimated by OLS, with the dependent variable in the column header. All covariates listed in Table B1 are considered. In the first two columns of Panel A, the dependent binary variables are based on objective clinical health measures; the diabetes measure in column (3) is self-reported. In Panel B, the dependent variables measure the difference between the medical indication based on the clinical measures taken, and the self-reports about medical diagnoses. For more information on how the variables were generated, see Section 5.3.1. The number of observations for all models is 6,550. The "mean" refers to the mean of the dependent variable in the column header.

Appendix C: Solution of the Theoretical Model

For notational simplicity, we drop the time index and the distinction between East and West German consumption whenever it does not generate confusion. Due to the linear-quadratic structure of the model, we consider the following value function:

$$\mathcal{V}(F,N,A) = \alpha_1 F + \alpha_2 F^2 + \alpha_3 N + \alpha_4 N^2 + \alpha_5 + \mu A.$$

From the first order conditions with respect to n, f and q, the optimal consumption of food and non-food is obtained as a function of the (yet unspecified) parameters of the optimal value function:

$$n = \alpha_3 + \hat{n} + (2\alpha_4 + U_{nN}) N - \alpha_5 p^n, \tag{23}$$

$$f = \alpha_1 + \hat{f} + (2\alpha_2 + U_{fF}) F - \alpha_5 p^f, \tag{24}$$

$$g = \hat{g} - \mu p^g. \tag{25}$$

Notice that μ must be positive to ensure that the marginal utility of the utility function (11) with respect to non-food is positive: $\partial U/\partial g = \hat{g} - g = \mu p^g > 0$.

Replacing the above expressions in the HJB equation yields a function which only depends on state variables and parameters. Let $r = \rho$, $\Omega_f = \sqrt{(\rho+2\delta)(\rho+2\delta-4U_{fF})} > 0$ and $\Omega_n = \sqrt{(\rho+2\delta)(\rho+2\delta-4U_{nN})} > 0$. Using the Method of Undetermined Coefficients yields:

$$\alpha_1 = \frac{\hat{f}-\mu p^f}{\rho+\Omega_f}(2\delta+\rho-\Omega_f), \qquad \alpha_2 = \frac{1}{4}(2\delta+\rho-2U_{fF}-\Omega_f), \tag{26}$$

$$\alpha_3 = \frac{\hat{n}-\mu p^n}{\rho+\Omega_n}(2\delta+\rho-\Omega_n), \qquad \alpha_4 = \frac{1}{4}(2\delta+\rho-2U_{nN}-\Omega_n), \tag{27}$$

$$\alpha_5 = \frac{1}{2\rho}\left[\hat{g}^2 + \left(\hat{f}+\alpha_1\right)^2 + (\hat{n}+\alpha_3)^2 + \left((p^n)^2 + (p^f)^2 + (p^g)^2\right)\mu^2\right] + \frac{\mu}{\rho}\left[M - p^g\hat{g} - p^f\left(\hat{f}+\alpha_1\right) - p^n(\hat{n}+\alpha_3)\right]. \tag{28}$$

The coefficient μ represents the shadow value of the assets (the impact of a marginal increase in assets on the consumer's value function) which depends on prices, among other factors. It is determined by replacing the FOCS into $\dot{N}, \dot{F}, \dot{A}$ and solving the corresponding system of linear differential equations. Defining $\Psi_f = \delta(\rho+2\delta-\Omega_f) - 2U_{fF}(\rho+2\delta)$ and $\Psi_n = \delta(\rho+2\delta-\Omega_n) -$

$2U_{nN}(\rho+2\delta)$, yields $\mu=\varepsilon_1/\varepsilon_2$, where

$$\begin{aligned}
\varepsilon_1 &= (\rho A_0+M-p^g\hat{g})(\rho+\Omega_f)(\rho+\Omega_n) \\
&\quad +2\left[\hat{f}p^f(\rho+\Omega_n)-\hat{n}p^n(\rho+\Omega_f)\right](\rho+\delta) \\
&\quad +2p^f\Psi_f\frac{\rho+\Omega_n}{(\rho+\Omega_f)^2}\left[\rho(\rho+\Omega_f)F_0+2\hat{f}(\rho+\delta)\right] \\
&\quad +2p^n\Psi_n\frac{\rho+\Omega_f}{(\rho+\Omega_n)^2}\left[\rho(\rho+\Omega_n)N_0+2\hat{n}(\rho+\delta)\right], \qquad (29)\\
\varepsilon_2 &= -(p^g)^2(\rho+\Omega_f)(\rho+\Omega_n)-2\left[(p^n)^2(\rho+\Omega_f)+(p^f)^2(\rho+\Omega_n)\right](\rho+\delta) \\
&\quad +\frac{4(p^f)^2(\rho+\Omega_n)(\rho+\delta)}{(\rho+\Omega_f)^2}\Psi_f+\frac{4(p^n)^2(\rho+\Omega_f)(\rho+\delta)}{(\rho+\Omega_n)^2}\Psi_n. \qquad (30)
\end{aligned}$$

Replacing the values of $\alpha_1,\alpha_2,\alpha_3,\alpha_4,\alpha_5$ and μ in (23) and (24) and rearranging yields the policy functions (31) and (32):

$$n^*=\frac{2(\rho+\delta)}{\rho+\Omega_n}(\hat{n}-\mu p_t^n)+\frac{1}{2}(\rho+2\delta-\Omega_n)N_t, \qquad (31)$$

$$f^*=\frac{2(\rho+\delta)}{\rho+\Omega_n}\left(\hat{f}-\mu p_t^f\right)+\frac{1}{2}(\rho+2\delta-\Omega_f)F_t, \qquad (32)$$

Note that the requirement $\mu>0$, which we imposed to ensure that the marginal utility of the composite good g is positive, ensures that the law of demand holds for food consumption choices, for any given consumption experience. The sign of the coefficients of N_t and F_t depends on the sign of U_{nN} and U_{fF}, respectively.

In the long-run equilibrium, consumption of novel and familiar food will be:

$$n_{ss} = \delta N_{ss}=\delta\frac{(\delta+\rho)(\hat{n}-p^n\mu)}{\delta(\delta+\rho)-(2\delta+\rho)U_{nN}}, \qquad (33)$$

$$f_{ss} = \delta F_{ss}=\delta\frac{(\delta+\rho)\left(\hat{f}-p^f\mu\right)}{\delta(\delta+\rho)-(2\delta+\rho)U_{fF}}. \qquad (34)$$

which depends, among other factors, on market prices, income and wealth. Let $\hat{n}-p^n\mu>0$ and $\hat{f}-p^f\mu>0$ to ensure that the steady state levels of consumption are positive (and also ensure that novel steady state consumption respects the law of demand ($\partial N^{ss}/\partial p^n<0$), which requires $\alpha_5+p^n\partial\mu/\partial p^n>0$.)

Replacing the policy functions (31) and (32) in the differential equations $\dot{F}_t$, $\dot{N}_t$ and $\dot{A}_t$, and solving yields the time path of food consumption experiences:

$$N_t = \left(1 - e^{\lambda_n t}\right) N_{ss} + e^{\lambda_n t} N_0 \tag{35}$$

$$F_t = \left(1 - e^{\lambda_n t}\right) F_{ss} + e^{\lambda_n t} F_0 \tag{36}$$

where $\lambda_n := \rho - \Omega_n$ and $\lambda_f := \rho - \Omega_f$ are the two eigenvalues that are required to be negative to ensure saddle point stability. This is equivalent to require $\delta(\delta+\rho) - (2\delta+\rho) U_{nN} > 0$ and $\delta(\delta+\rho) - (2\delta+\rho) U_{fF} > 0$.

Replacing (35) and (36) in (31) and (32), yields the optimal path of food consumption choices reported in Proposition 1:

$$n_t = \alpha_t + \beta_t N_0, \tag{37}$$

$$f_t = \kappa_t + \phi_t F_0. \tag{38}$$

where

$$\alpha_t = \left[\delta - (\delta + \lambda_n) e^{\lambda_n t}\right] N_{ss}, \qquad \beta_t = (\delta + \lambda_n) e^{\lambda_n t} \tag{39}$$

$$\kappa_t = \left[\delta - (\delta + \lambda_f) e^{\lambda_f t}\right] F_{ss}, \qquad \phi_t = (\delta + \lambda_f) e^{\lambda_f t} \tag{40}$$

Taking differences between East and West at each point in time yields

$$\Delta n_t = n_t^E - n_t^W = \beta_t \left(N_0^E - N_0^W\right) = -\beta_t N_0^W \tag{41}$$

$$\Delta f_t = f_t^E - f_t^W = \beta_t \left(F_0^E - F_0^W\right) = \phi_t \left(F_0^E - F_0^W\right) \tag{42}$$

Note that α_t and κ_t depend on the steady state values, which reflect market prices, available income and wealth. The sign of β_t and ϕ_t (which depends on $\delta + \lambda_n$ and $\delta + \lambda_f$, respectively) can either be positive or negative. More specifically $\beta_t > 0$ ($\phi_t > 0$) if and only if novel food (familiar food) features taste formation, $U_{nN} > 0$ ($U_{fF} > 0$) and it is negative if it features habit formation, $U_{nN} < 0$ ($U_{fF} < 0$), as reported in Proposition (2) for novel food, and Propositions (3) and (4). Since the sign of Δn_t only depends on β_t, we can proxy life under socialism with N_0^W. For the sign of Δf_t, instead, there is no one-to-one relation because in principle $F_0^E - F_0^W$ could have any

sign. The difference Δf_t is positive if $\phi_t \left(F_0^E - F_0^W\right) > 0$. The term in brackets is positive (negative) depending on whether $F_0^E - F_0^W$ is positive (negative). If, pre-reunification, the consumption of familiar food was at its steady state, then $sign\left(F_0^E - F_0^W\right) = sign\left(f_0^E - f_0^W\right)$. Hence $sign\left(\Delta f_t\right) = sign\left(U_{fF}\right) sign\left(\Delta f_0\right)$. Since we have empirical information on both consumption of familiar food at the time of the reunification Δf_0, and consumption of familiar food in a subsequent period Δf_t, we can infer the properties of reinforcement or satiation of past consumption experience with familiar food on current preferences. Using (37) and (38) we can compute changes in consumption:

$$\Delta n_{ts} = n_t - n_s = \alpha_{ts} + \beta_{ts} N_0 \tag{43}$$

$$\Delta f_{ts} = f_t - f_s = \kappa_{ts} + \phi_{ts} F_0 \tag{44}$$

where

$$\begin{aligned}
\alpha_{ts} = \alpha_t - \alpha_s &= -\left(\delta + \lambda_n\right)\left(e^{\lambda_n t} - e^{\lambda_n s}\right) N_{ss} > 0 \quad \Leftrightarrow \quad U_{nN} < 0 \\
\beta_{ts} = \beta_t - \beta_s &= \left(\delta + \lambda_n\right)\left(e^{\lambda_n t} - e^{\lambda_n s}\right) > 0 \quad \Leftrightarrow \quad U_{nN} < 0 \\
\kappa_{ts} = \kappa_t - \kappa_s &= -\left(\delta + \lambda_f\right)\left(e^{\lambda_f t} - e^{\lambda_f s}\right) F_{ss} > 0 \quad \Leftrightarrow \quad U_{fF} < 0 \\
\phi_{ts} = \phi_t - \phi_s &= \left(\delta + \lambda_f\right)\left(e^{\lambda_f t} - e^{\lambda_f s}\right) > 0 \quad \Leftrightarrow \quad U_{fF} < 0
\end{aligned}$$

Similarly to what we have found above, β_{ts} is positive (negative) if $\delta + \lambda_n > 0$ $(\delta + \lambda_n < 0)$ which holds if and only if $U_{nN} > 0$ $(U_{nN} < 0)$, as stated in Proposition 1. Analogue reasoning holds for ϕ_{ts} and U_{fF}.

Appendix D: Empirical Identification

This section discusses in more detail the different necessary assumptions in order to interpret the estimated coefficients of the model in equation (20) and (21) as 'causal.' After having adjusted the sample with a set of socio-demographic, educational, and work-related variables, the coefficient β identifies differences between East and West Germans in terms of *(A)* consumption levels in 1991, *(B)*changes in consumption between 1988 and 1991, *(C)* body weight in 1991 and *(D)* changes in body weight between 1988 and 1991. ψ informs us about the consumption and body weight dynamics between 1991 and 1998.

We use three cross-sectional data sets from 1991/1992, 1997/1998, and 2005 and a strictly causal interpretation of β and ψ requires several assumptions. However, almost all assumptions are standard and well-established in the literature that uses the German reunification as a natural experiment (Frijters et al., 2004b,a, 2005; Fuchs-Schündeln and Schündeln, 2005; Alesina and Fuchs-Schündeln, 2007; Fuchs-Schündeln, 2008; Rainer and Siedler, 2013; Brosig-Koch et al., 2011; Heineck and Süssmuth, 2013; Bursztyn, 2012; Burchardi and Hassan, 2013; Friehe and Mechtel, 2014).

One first assumption states that the division of Germany and the erection of the Berlin Wall were unexpected and quasi-random events that divided an otherwise united, and thus similar, population. In one part of divided Germany, the GDR—a socialist regime, established a centrally-planned economy with limited food variety. In the other part of divided Germany, the FRG—a western capitalist economy, offered a large variety of Western food products. The Berlin Wall divided the GDR and the FDR from 1961 until 1989 for 28 years. During that time, it was basically impossible to migrate to West Germany. The fall of the Wall on November 9, 1989 was as unexpected as its construction (see Section 3.1).

Second, after the fall of the Wall, from 1989 to 2004, it is estimated that 3.4 million mostly young and well-educated East Germans migrated to West Germany (Hunt, 2009). Although our oldest dataset was in the field shortly after the reunification, in 1991/1992, we cannot capture East Germans who migrated to West Germany between 1989 and 1991/1992, since the 1991/1992 questionnaire only refers to the *current* residency of the respondents. In the first year after the reunification, it is estimated that 400,000 East Germans migrated to West Germany (Hunt, 2009). This migration introduces measurement error that is likely to downward bias the estimates obtained with the 1991/1992 dataset (Wagner and Ziebarth, 2015). However, in the second and third dataset employed, we can clearly identify people who were socialized in the GDR and lived there before 1989.

Actually, the third dataset from 2005 is rich enough to disentangle long-term weight effects of an eastern socialization from East-West migration: 15 years after the fall of the Wall, it allows us to compare the BMIs of *(i)* East Germans living in West Germany with *(ii)* East Germans living in East Germany and *(iii)* West Germans who stayed in West Germany. While the two datasets from 1998 and 2005 allow us to study long-term effects of eastern socialization, they do not allow us to unambiguously trace changes in food consumption and diet-related health back to one single impact factor.

This is because the third necessary assumption for a *narrow* causal interpretation of the treatment 'transition from life under socialism to capitalism' is that post-reunification unobservables did not affect the dependent variables differently for East than West Germans. Obviously, this is a bigger concern the larger the time gap between the fall of the Wall and the survey. For example, the unemployment rate in East Germany has been consistently about twice as large as West Germany (Sinn, 2002; Uhlig, 2006; Burda, 2006). While many of the food consumption categories represent low budget staple foods that are unlikely to be strongly confounded by unemployment, researchers have shown that unemployment affects health (Sullivan and von Wachter, 2009; Browning and Heinesen, 2012; Marcus, 2013). However, note that we adjust differences in the outcome variables with a rich set of socioeconomic controls, among them several (un)employment, educational and household income measures (see Tables B1 and B1). In addition, even 10 or 15 years after the reunification, one could still interpret differences in consumption patterns between East and West Germans as an overall reduced form 'intention-to-treat' effect that incorporates changes in unemployment or environmental conditions because such changes were all exogenously triggered by life under socialism and the reunification. However, this latter effect would then represent the combined overall impact of 'life under socialism plus all post-reunification adaptation processes to capitalism.' Note that we empirically test whether these potential confounding factors confound our main message of the change in diet among East Germans due to novelty consumption. For example, we show that the unemployed and blue collar workers were *not* the ones who predominantly changed their diet and gained weight in East Germany after the reunification—the effect was mainly driven by white collar workers and the better off.

Finally, the core empirical analysis (and the model) cannot include thousands of specific measures of food quality and prices but incorporates changes in these two factors in a reduced-form manner by the variable $EastGerman_i$. It is obvious that food availability dramatically increased overnight in the GDR. However, food quality and thousands of relative food prices also changed.

One cannot comprehensively model the very complex simultaneous changes in quality, prices, and availability. However, one can interpret the observed change in consumption of selected food categories as an overall reduced form effect that normalizes the quality, price and availability change in the course of the reunification. This approach mirrors and links to our theoretical model in which we condensate all these economic development-related changes into one single, specific variable: price.

In the empirical model, to shut down as many potential confounding channels as possible, we focus on consumption of selected food items that stand representative for familiar food, such as boiled potatoes and meat, and for novel food, such as exotic fruits and convenience food. We also provide information on pre and post-reunification prices and consumption. It is reasonable to assume that the quality of familiar food did not change significantly after the reunification. In addition, for most staple familiar food, price effects are unlikely to play a major confounding role due to arguably inelastic demand (Hsieh et al., 2009).

To sum up, the coefficient β measures differences in food consumption patterns between East and West Germans right after the reunification. When the dependent variable elicits *changes* in consumption and body weight in 1991 (cf. Table B1), β can be interpreted as a difference-in-differences estimator. It assesses the change in consumption for East Germans minus the change for West Germans over time. When employing the pooled 1991 and 1998 data, the interaction term ψ can also be thought of as a DiD model assessing the long-term effect of a sharp exogenous economic development shock on consumption. This longer-term adjustment is theoretically illustrated in Figures 1 and 2.

To the extent that the identification assumptions hold, the identified consumption differences between East and West can be traced back to life under socialism vs. capitalism. One can interpret the exposure effect broadly and view all post-reunification events that also affected food consumption as the long-term effect of the division and subsequent reunification. Thus, the German example allows us to study the immediate and long-term effects of economic development—in the form an abrupt change from a communist to a capitalist economy—on food consumption and body weight. However, to be on the safe side, we interpret the findings as strongly suggestive, instead of strictly causal. The empirical post-reunification consumption pattern are primarily exploited to implement the empirical test we first derived theoretically from our theory of novelty consumption. This test allows us to test for the existence of non-separable intertemporal preferences and for whether food consumption features habit formation or learning.