

THE CHANGING CLIMATE OF FOOD PRODUCTION:  
EXPLORING CONSUMER BEHAVIOR  
AND TRANSFORMATION IN THE FOOD INDUSTRY

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# Zusammenfassung

## Das sich verändernde Klima in der Lebensmittelproduktion

Die Herausforderung, globale Probleme wie zum Beispiel Klimawandel und Schädigungen der Umwelt zu bewältigen, drängt Gesellschaften zunehmend dazu, die notwendigen Arten der Veränderung hin zu einer größeren Nachhaltigkeit in Betracht zu ziehen. Innerhalb solcher Diskussionen spielen Veränderungen von Methoden der Lebensmittelproduktion aufgrund der zunehmenden Bewusstheit der involvierten negativen Folgen eine zentrale Rolle. Bezüglich der Auswirkungen auf die Umwelt sind die Mängel des momentan vorherrschenden Systems in mehrerer Hinsicht deutlich. So steht der extensive Rückgriff auf Industriechemikalien im Rahmen der Lebensmittelproduktion, wie Pestizide und Düngemittel, im Zusammenhang mit externen Kosten in Form von Luft- und Wasserverschmutzung sowie einer nachlassenden Bodenqualität (Pimentel, 2009). Wie wichtig es ist, solche Umweltschädigungen zu verringern wird weiterhin durch den Fakt erkennbar, dass circa ein Viertel aller Grundwasserkörper in der Europäischen Union sowie in den Vereinigten Staaten einen mangelhaften (und sich verschlechternden) chemischen Zustand haben (EEA, 2012; DeSimone et al., 2014). Eine der wesentlichen Verursacher solcher Verunreinigung sind in Agrarsystemen eingesetzte Pestizide, welche in der Europäischen Union 20% der Fälle von Grundwasserverschmutzung und 16% der Verunreinigung von Flüssen und Übergangsgewässern ausmacht.

In Anbetracht der Möglichkeit eines unumkehrbaren Klimawandels ist festzuhalten, dass der landwirtschaftliche Sektor in seiner Gesamtheit für 22% der globalen Emissionen von Treibhausgasen (THG) verantwortlich ist. Dieser Emissionsanteil ist größer als der des gesamten Transportsektors und gleichauf mit den Emissionsleveln des Industriesektors (McMichael et al., 2007). Mit der Berücksichtigung des breiteren Einflusses produktionsbezogener Aktivitäten auf Ökosysteme durch beispielsweise das Abholzen von Wäldern kann der Emissionsanteil der Land-

wirtschaft auf eher 35% geschätzt werden (Stern, 2007).<sup>1</sup> Was dies betrifft, tragen in herausstechender Weise die Umstände rund um die Nutztierhaltung zum Klimawandel bei – größtenteils ist es ihrem unverhältnismäßigen Anteil an THGs mit hohem Treibhauspotential wie Methan und Dickstickstoffoxid geschuldet. Der „lange Schatten“ der industriellen Nutztierhaltung kennzeichnet dieselbe daher als eine der wesentlichen Beiträge zu den schwerwiegenden Umweltproblemen unserer Zeit (Steinfeld et al., 2006).

Um die Größenordnung der Probleme erfassen zu können, ist es jenseits der besonderen Kritik an der Nutztierhaltung notwendig, den kumulativen Einfluss der diversen Aktivitäten im Kontext der großindustriellen Lebensmittelproduktion mit zu berücksichtigen. Die Transformation der land- und forstwirtschaftlichen Produktion ist daher als eine der Lösungen mit dem größten Potential für eine Abschwächung des Klimawandels etabliert – neben der Verbesserung der Energieeffizienz und der Förderung von erneuerbaren Energien (Nauclér und Enkvist, 2009). Zwar wird der Wunsch nach einer nachhaltigeren Lebensmittelindustrie von der schieren Komplexität geplagt, die aus der großen Anzahl ihrer beweglichen Teile resultiert. Vereinfacht kann jedoch festgehalten werden, dass der Anstoß für Veränderung in erster Linie durch die steigende Bewusstheit der Kosten des anhaltenden Gebrauchs existierender Produktionsmethoden gegeben wird. Um die externen Kosten der Lebensmittelproduktion zu verstehen, muss unser Fokus allerdings über Klimawandel und Umweltschädigung hinaus erweitert werden – ganz gleich wie wichtig diese Themen sind. Tatsächlich wird als Folge der zunehmenden Verwirklichung von Ernährungssicherheit besonders in stärker entwickelten Ländern eine wachsende Anzahl an neuen Problemstellungen bezüglich der Produktion von Lebensmitteln relevant. Eine unvollständige Auflistung solcher Probleme beinhaltet: die Entstehung einer regelrechten Adipositas-„Epidemie“, die schlechte ernährungsphysiologische Qualität von massenproduzierten Nahrungsmitteln, das Auftreten von lebensmittelbedingten Krankheiten und Lebensmittelskandalen mit schwer zu vergessenden Namen wie „Rinderwahn“ und „Maul- und Klauenseuche“, außerdem die Gefahr von Antibiotikaresistenzen für den Menschen durch den übermäßigen Antibiotikaeinsatz in der Massentierhaltung, ethische Bedenken in Bezug auf den Tierschutz in der Massentierhaltung, die Lebensfähigkeit ländlicher Gemeinden sowie die Gesundheit und das Wohlbefinden landwirtschaftlicher Arbeitskräfte.

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<sup>1</sup> Tatsächlich wird in weiterer Forschung argumentiert, dass die Nutztierhaltung für mehr als die Hälfte aller globalen Treibhausgasemissionen verantwortlich sei, sobald alle Aspekte dieses Sektors berücksichtigt werden (Goodland und Anhang, 2009).

In einer gewissen Parallele zu umweltbezogenen Problemen signalisieren die schwerwiegenden Kosten, die aus der unzureichenden Sicherheit und gesundheitlichen Unbedenklichkeit von Nahrungsmitteln der Lebensmittelindustrie resultieren, die Schwierigkeit des Festhaltens am *Business-as-usual*. Innerhalb dieser Einleitung wird speziell die Lage in den Vereinigten Staaten bedacht um den anhaltenden Problemen in der Lebensmittelindustrie einen Kontext zu geben. Dies ist vornehmlich aus zwei Gründen vorteilhaft: erstens wegen der dort lang etablierten industriellen Agrarwirtschaft und zweitens aufgrund des besonderen Ausmaßes der damit verbundenen negativen Auswirkungen. Im Rahmen der gesundheitlichen Unbedenklichkeit von Nahrungsmitteln sticht die U.S.-amerikanische Adipositas-„Epidemie“ heraus, auch in Hinblick auf die erhebliche Abweichung dieser Herausforderung von den historischen Anliegen der Lebensmittelindustrie. In den vergangenen Jahrzehnten erreichte der Prozentsatz adipöser beziehungsweise übergewichtiger Erwachsene in den U.S.A. erschreckende 35,1% (respektive 69,0%) (CDC/NCHS, 2014). Zudem verdoppelte sich die Finanzlast der medizinischen Behandlung dieser Krankheit seit 1998 auf mittlerweile 147 Milliarden US-Dollar – oder 10% aller medizinischer Ausgaben in den U.S.A. (Finkelstein et al., 2009).<sup>2</sup> Tatsächlich wird mit Blick auf den erwarteten Anstieg in der Prävalenz von Fettleibigkeit geschätzt, dass bis zu 500 Milliarden US-Dollar in den nächsten zwei Jahrzehnten gespart werden könnten, wenn die Adipositasrate auf dem jetzigen Level gehalten würde (Finkelstein et al., 2012). Hinsichtlich des steigenden Aufkommens von lebensmittelbedingten Erkrankungen ist festzuhalten, dass das zunehmend gewagte Versprechen von Lebensmittelsicherheit das Ausmaß an Vertrauen in die Lebensmittelindustrie durch die Förderung eines generellen Zustands von Misstrauen bei den Konsumenten beeinflusst („a general state of distrust among consumers“; FAO, 2003: 3). Allein in den Vereinigten Staaten treten jährlich 48 Millionen Fälle von Lebensmittelvergiftungen auf (dies entspricht einem aus sechs US-Amerikanern), begleitet von schwerwiegenderen Vorfällen in Form von 128.000 Krankenhauseinweisungen und über 3.000 Todesfällen (CDC, 2011). So wurde geschätzt, dass die Kosten akuter lebensmittelbedingter Erkrankungen jährlich bei 152 Milliarden US-Dollar liegen, von denen ein Anteil von 39 Milliarden US-Dollar das Resultat von Frischprodukten ist (Scharff, 2010). Hinsichtlich Produktivitätsverlusten, medizinischen Kosten und verlorener

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<sup>2</sup> Da diese Schätzungen lediglich die Kosten für Erwachsene beinhalten, werden jene der fast 20% jüngerer Personen zwischen 6 und 19 Jahren nicht berücksichtigt, die ebenfalls an Adipositas leiden (CDC/NCHS, 2014).

Freizeit beträgt die monetäre Belastung für die U.S.A. und ihre Bürger diesbezüglich circa 1,4 Billionen US-Dollar (Roberts, 2007).<sup>3</sup>

Durch die stetig wachsenden Kosten, mit denen heutige Gesellschaften konfrontiert sind, wird es schwierig die potentiellen Vorzüge einer Transformation der Lebensmittelindustrie zu ignorieren. Auch wenn die Notwendigkeit einer Veränderung langsam immer mehr Zustimmung erhält, bleibt die Frage danach, wie die weitreichenden schädlichen Auswirkungen großindustrieller Lebensmittelproduktion verringert werden können unbeantwortet. Gegeben der Komplexität dieses Unterfangens ist es verständlich, dass zahlreiche und divergierende Perspektiven von Transformation verbreitet sind. Und dennoch ist die Ebnung des Weges für nachhaltigere Gesellschaften unmittelbar damit verknüpft, ob das Gewirr der verschiedenen existierenden Sichtweisen in Einklang gebracht werden kann. In einem ersten Schritt muss bewusst werden, was im Kern solcher Uneinigkeiten steckt – was wiederum dazu führt, die Relevanz großindustrieller Produktion innerhalb des sich verändernden Klimas in der Lebensmittelproduktion zu überdenken. Ist es ausreichend, minimale Veränderungen am vorherrschenden Ansatz anzustreben, damit die Massenproduktion ihre hegemoniale Stellung in der Lebensmittelindustrie wiedergewinnen kann? Oder fordert das Aufkommen neuer Herausforderungen wie der Adipositasproblematik und des Klimawandels stattdessen Transformation auf einer grundlegenden Ebene? Falls – aus welchem Grund auch immer – die Ausrichtung der Lebensmittelproduktion auf neue Ziele mehr als nur eine Transformation in der Massenproduktion verlangt, muss für die Schaffung einer soliden Grundlage für den Übergang zu nachhaltigeren Gesellschaften die potentielle Bedeutsamkeit alternativer Ansätze mitberücksichtigt werden.

Die vorliegende Dissertation beschäftigt sich weitgehend mit Inhalten und Themen im Kontext von Transformation in der Lebensmittelindustrie. Jedes der Kapitel repräsentiert eine abgegrenzte Exploration der Notwendigkeit eines Wandels auf der Ebene individuellen Verhaltens für die Schaffung der potenziellen Bedingungen für Transformation. Auch wenn es im Anblick eines umfassenden Übergangs zu nachhaltigeren Gesellschaften oft übersehen wird, so wird argumentiert, dass eine veränderte Beziehung von Individuen zu Aufgaben der Lebensmittelproduktion und des -verbrauchs ein wesentliches Fundament für einen solchen Wandel bietet. Angesichts des Umfangs dieses betrachteten Phänomens und der Neuheit dieser Sichtweise ist es folglich hilfreich, einen allgemeinen Hintergrund

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<sup>3</sup> Um dies in Relation zu setzen: Das jährliche BIP der Vereinigten Staaten beträgt 15 Billionen US-Dollar.

über das Thema ‘Transformation’ zu geben. Der nächste Abschnitt soll dem Leser daher einen Überblick über die wesentlichen Merkmale verschaffen, die bei der Charakterisierung von Transformation in der Lebensmittelindustrie beleuchtet werden. Insbesondere wird festgestellt, dass sich die Vielfältigkeit von Transformation nicht nur in den Weiterentwicklungen des dominanten Ansatzes der Lebensmittelproduktion manifestiert, sondern auch in der Entstehung alternativer Ansätze. Gegeben der Tendenz letzteres abzutun, betrachtet der darauffolgende Abschnitt die anhaltende Relevanz vorgefasster Vorstellungen über die Lebensmittelindustrie – besonders jener Auffassungen, die aus der Zeit der industriellen Revolution in der Produktion von Nahrungsmitteln stammen. Allerdings wird als Antwort auf das sich verändernde Klima in der Lebensmittelproduktion darauf hingewiesen, inwiefern die Erforschung der Evolution des Verbraucherverhaltens in der Lebensmittelindustrie eine nützliche und unverwechselbare Perspektive auf die Entwicklungen des Systems im Kontext von Transformation leisten kann. Der abschließende Abschnitt skizziert sodann den generellen Rahmen und den Aufbau der vorliegenden Dissertation.

## Die Vielfalt von Transformation in der Lebensmittelindustrie

Einen Mangel an Fragen dazu, wie es gelänge Transformation in der Lebensmittelindustrie zu erreichen gibt es nicht. Die Antworten bleiben allerdings recht widersprüchlich – ein Resultat der vielen verschiedenen Perspektiven von Transformation, die existieren. Die Förderung einer gesünderen und nachhaltigeren Nahrungsmittelversorgung hängt deswegen maßgeblich von unserer Fähigkeit ab, die Ambiguität innerhalb dieser Diskussionen zu verstehen. Bevor jedoch erklärt werden kann warum Transformation als solche Herausforderung gesehen wird, ist es nötig, das unterschiedliche Verständnis von Transformation in den Beschreibungen der jüngsten Veränderungen in der Lebensmittelindustrie zu berücksichtigen.

Im Allgemeinen reflektieren die meisten Darstellungen von Transformation in irgendeiner Form die historische und anhaltende Bedeutung der großindustriellen Lebensmittelproduktion. Zum einen wird häufig die Wichtigkeit erwähnt, weitere Produktivitäts- und Effektivitätsoptimierungen in der Lieferkette zu erreichen. Es wird insbesondere argumentiert, dass die Verstärkung des Ausmaßes aller lebensmittelbezogenen Tätigkeiten die Relevanz der Förderung einer besseren Partnerschaft zwischen großen Firmen an allen Gliedern der Versorgungskette demonstriert (Kaufman, 1999; MacDonald und McBride, 2009). Mit dieser

Zielsetzung kann Transformation in diesem Sinne auch auf der Ebene der Nahrungsmittelerzeugung und dem -vertrieb verfolgt werden. Im Besonderen scheint der zunehmende Einsatz von Informations- und Kommunikationstechnologie die Organisation der Lebensmittelversorgungskette sinnvoll zu beeinflussen, indem Einzelhändlern der Weg geebnet wird, entscheidende Aufgaben der Produktspezifikation und Qualitätskontrolle zu übernehmen (siehe Harvey et al., 2002, Kap. 8). Zusätzlich zu der Schaffung einer neuen Beziehung zwischen Angebot und Nachfrage erleichtert die bessere Fähigkeit der Einzelhändler, Qualitätsgarantien zu geben – namentlich durch den Gebrauch privater Standards und Labels – eine grundlegende Verlagerung der Regulation durch öffentliche Behörden hin zu einem wachsenden Verlass auf private Regulation in Händen von Großunternehmen (Busch und Bain, 2004). Die zwei letztgenannten Entwicklungen illustrieren folglich, warum die wachsende Dominanz von Einzelhändlern in den globalen Versorgungsketten eine vorrangige Rolle für die Erklärung der Veränderung der Lebensmittelproduktion im Laufe der Zeit spielt.

Die alleinige Fokussierung auf das gegenwärtige Regime bringt dennoch das Risiko mit sich, einen der einzigartigen Aspekte von Transformation in der Lebensmittelindustrie zu übersehen: die wachsende Betrachtung ethischer und umweltbezogener Faktoren in der Produktion von Lebensmitteln. So ist der globale Markt für ökologische Lebensmittel und Getränke ein zunehmend prominenter Nischen-sektor in dieser Industrie. Mit einem jährlichen Wachstum von durchschnittlich 20% über das letzte Jahrzehnt vervierfachte sich der weltweite Umsatz von ökologischen Produkten auf eine Summe von 64 Milliarden US-Dollar (Sahota, 2014). In Bezug auf ethische Erwägungen kann in ähnlicher Weise festgehalten werden, dass der globale Markt für zertifizierte Fair-Trade-Produkte, die eine Verbesserung der Einkommenssicherheit von Erzeugern anstreben, sich auf etwa acht Milliarden US-Dollar beläuft (Fair Trade, 2014). Als größter Markt für ökologische Erzeugnisse beläuft sich der Gesamtumsatz in den Vereinigten Staaten zuletzt auf geschätzte 35,9 Milliarden US-Dollar, was fast 5% der gesamten Lebensmittelindustrie ausmacht (OTA, 2015). Die wachsende Vertrautheit mit solchen Produkten wird zudem dadurch reflektiert, dass mit 81% nun die meisten Familien in den U.S.A. (zumindest) gelegentlich Bio-Kost konsumieren (OTA, 2013) und der Großteil der Einzelhandelsformate (82%) mittlerweile ökologische Erzeugnisse vertreibt (Food Marketing Institute, 2008).

Neben dem Aufschwung alternativer Produktionsmethoden wird die transformative Wirkung alternativer Systeme ebenfalls durch das (Wieder-)Aufkommen alternativer Handelsformate verkörpert, die besonderen Wert auf kürzere Lieferketten



und auf eine persönlichere Beziehung mit den Zulieferern aus der Landwirtschaft legen. Um ein Beispiel zu nennen: In den Vereinigten Staaten wuchs die Anzahl von Bauernmärkten allein zwischen 1994 und 2006 um 150% (Brown und Miller, 2008), womit diese alternative Beziehung zwischen Erzeugung und Verbrauch mittlerweile einen jährlichen Gesamtumsatz von 1,3 Milliarden US-Dollar aufzeigen kann (USDA, 2014). Darüber hinaus werden innovative Arrangements wie zum Beispiel so genannte Gemeinschaftshöfe bzw. von der Gemeinschaft geförderte Landwirtschaft ebenfalls häufiger (engl.: *community-supported agriculture*, CSA), welche eine neue Beziehung zwischen Erzeugern und Verbrauchern etablieren. Obgleich sie vor 20 Jahren praktisch nicht existent waren, gibt es nun bereits 12.617 CSAs in den Vereinigten Staaten (USDA, 2014). Solche Partnerschaften haben sich unter anderem als sehr günstig für kleinbäuerliche Betriebe erwiesen, indem sie durch den anteiligen Verkauf ihrer Ernten die Risiken der landwirtschaftlichen Erzeugung mindern können – während es im gleichen Zug Verbrauchern ermöglicht wird, eine große Vielfalt an lokalen Produkten zu einem erschwinglichen Preis zu kaufen und dabei die regionalen Bauern zu unterstützen (Bougherara et al., 2009). Allgemeiner kann das Wachstum alternativer Netze somit als ein wesentlicher Aspekt für den Wiederaufbau lokaler und regionaler Ernährungssysteme verstanden werden. Anstatt eines nebensächlichen Anliegens der größeren Lebensmittelindustrie repräsentieren alternative Netzwerke durch die Schaffung einer tragfähigen Alternative für Landwirte und Verbraucher daher einen ‘Grundpfeiler’ für Transformation in der Lebensmittelindustrie (Gillespie et al., 2007).

## Vorgefasste Vorstellungen und das Vermächtnis der industriellen Revolution in der Lebensmittelproduktion

In Anbetracht der kollidierenden Vorstellungen für den zukünftigen Entwicklungsweg der Lebensmittelindustrie ist es einfach, die Gemeinsamkeiten der verschiedenen Perspektiven aus den Augen zu verlieren. Ungeachtet ihrer Unterschiede repräsentiert jede dieser Darstellungen von Transformation einen Erklärungsversuch dafür, was erforderlich ist um sich den neuen Herausforderungen zu stellen mit denen die Lebensmittelproduktion konfrontiert ist. Durch die implizite Skizzierung einer Begründung dessen, warum solche Herausforderungen immer mehr in den Vordergrund rücken, bietet jede der Darstellungen von Transformation darüberhinaus eine andere Perspektive dafür, ob und in welchem Ausmaß die großindustrielle Lebensmittelproduktion fehlerhaft ist. Es kann argumentiert werden, dass der Mangel an Vertrauen in das existierende System das

Resultat einer Vielzahl an neuen Zielsetzungen ist, die gleichzeitig an Wichtigkeit erlangten – Zielsetzungen, für die das herrschende System ursprünglich nicht geschaffen wurde. Falls dies zutrifft – wobei darauf hinzuweisen ist, dass der industrielle Ansatz bei der Lebensmittelproduktion nicht notwendigerweise zu beschuldigen ist – wie wahrscheinlich ist es, dass dieses System selbst mit erheblichen Modifikationen sowohl diese wichtigen neuen Zielsetzungen angehen als auch weiterhin Steigerungen der Produktivität und Effizienz verfolgen kann? Kann diese Aufgabe eher durch eine Reorganisation der Lieferkette umgesetzt werden? Das heißt, ist die Möglichkeit weiterer Verbesserungen in Rückverfolgbarkeit und Qualitätssicherung durch die gestärkte Bedeutung von Einzelhändlern ausreichend um das Vertrauen wiederherzustellen? Oder ist es eher nicht vorstellbar, dass ein in Produktivitäts- und Effizienzerwägungen begründetes System diese unterschiedlichen und komplexen Probleme bewältigen kann, die momentan die Lebensmittelproduktion konfrontieren – wie zum Beispiel Klimawandel, die Sicherheit von Lebensmitteln sowie Fettleibigkeit? Und könnte aus diesem Grund der Aufstieg alternativer Ansätze eine grundlegendere Transformation in der Lebensmittelindustrie signalisieren, basierend auf einer Revision der Rolle der Lebensmittelproduktion in modernen Gesellschaften?

Zu einem großen Teil reflektiert die Verunsicherung in den Diskussionen über Transformation die Schwierigkeit, zu wissen, wie auf die verschiedenen neuen und immer relevanter werdenden Aufgaben der Nahrungsmittelproduktion reagiert werden kann. Um die oben gestellten Fragen zu beantworten, ist es jedoch nötig zu erkennen inwiefern Transformation in der Lebensmittelindustrie durch das Vertrauen in vorgefasste Annahmen erschwert wird, welche die Möglichkeit des Findens neuer Lösungen für die auftretenden Probleme begrenzen. Individuen, egal ob sie als Konsumenten, politische Entscheidungsträger oder als Figuren innerhalb der Lieferkette agieren, werden wahrscheinlich jene Veränderungen auswählen, die aus ihrer Sicht eine Bewältigung der neuen Herausforderungen für die Lebensmittelproduktion am besten gewährleisten können indem sie in Betracht ziehen, was sich in der Vergangenheit bewährt hat. Ob dies ein Problem für Transformation darstellt, hängt von der Basis dieser vorgefassten Vorstellungen ab – darüber hinaus ist es wichtig nachzuvollziehen, welche Richtungen des Wandels dadurch verhindert werden.

Trotz der zunehmenden Popularität alternativer Systeme sind die betrachteten Arten der Veränderung tendenziell solche, die entweder etablierte Prinzipien des existierenden Systems untermauern oder solche, die sich leicht darin integrieren lassen. Bezüglich Produktinnovation bilden diese unsichtbaren Grenzen einen

starken Bias gegen radikale Innovationen, sodass tatsächlich die große Mehrheit (77%) der jedes Jahr neu eingeführten Produkte sich nur durch sehr wenig bis keine Neuheit auszeichnen (Costa und Jongen, 2006).<sup>4</sup> Um den Mangel an radikalen Innovationen zu erklären macht sich der Großteil der Forschungsliteratur eine Sichtweise des Lebensmittelsektors zu Nutze, die einen wesentlichen Wandel als nicht erforderlich erscheinen lässt. Ist der Sektor mit einem erheblichen Wettbewerb und dem limitierten Potential für innovativen Erfolg konfrontiert, so spiegelt dies lediglich die Mühen des Navigierens innerhalb einer traditionellen und reifen Industrie wider. Mit Sicht auf die Unternehmen erklären diese Schwierigkeiten ebenfalls die Tendenz, sich stark auf nur einige wenige Strategien zur Profitmaximierung zu stützen. Um die Einschränkungen der 'traditionellen' Lebensmittelindustrie zu bewältigen sind typischerweise als tragfähig angesehene Konzepte solche Strategien, die Kosten möglichst gering halten, die nur minimale und inkrementelle Veränderungen an Produkten und Produktionsprozessen anstreben sowie Strategien, die stark auf neue Vertriebsideen bauen (Galizzi und Venturini, 1996; Traill und Grunert, 1997).

Allgemein machen die vorgefassten Vorstellungen in Bezug auf eine traditionelle Lebensmittelindustrie deutlich, warum der Verlass auf einen prominenten Agrarsektor als etwas erscheint, über das wir hinauswachsen sollten. So sprechen zum Beispiel dessen minimale Beiträge für Beschäftigung und ökonomisches Wachstum in fortgeschrittenen Wirtschaftssystemen für eine rückläufige Bedeutung dieses Sektors als ein Merkmal der Entwicklung.<sup>5</sup> Aus diesem Grund wird weiterhin rationalisiert, dass selbst in dem Fall, dass in diesem Gebiet radikale Innovationen hervorgebracht werden, die Verbraucher daran wahrscheinlich nicht interessiert sein würden. Fest verwurzelt als ein Gesetz ökonomischer Entwicklung (Engel, 1857) hält sich die Vorstellung, dass ein steigendes Niveau des Pro-Kopf-Einkommens es ermöglicht, den Konsum weg von essentiellen Gütern wie Nahrungsmittel zu diversifizieren und diesem Ausgabenbereich immer weniger Beachtung schenken zu müssen. Die Verfügbarkeit einer erstaunlichen Palette an Innovationen und Erfindungen in einer großen Anzahl von Produktkategorien scheint somit die Aufmerksamkeit der modernen, urbanen Verbraucher in etliche Richtungen zu ziehen. Infolgedessen reduzierte sich der Prozentsatz des Haus-

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<sup>4</sup> Hierzu steht im Kontrast, dass nur 2,2% aller neu eingeführten Produkte als völlig neuartig beschrieben werden können.

<sup>5</sup> Im Fall der Vereinigten Staaten machen Agrarproduktion und Nutztierhaltung lediglich kärgliche 0,7% des BIP aus und weniger als 2% der Beschäftigung (Dimitri et al., 2005) – besonders im Gegensatz zur Jahrhundertwende, als mehr als ein Drittel der Beschäftigung und des BIPs durch diesen Sektor gebunden wurde und 60% der Bevölkerung in ländlichen Regionen lebte (Council of Economic Advisors, 2006).

haltseinkommens, der sich dem Lebensmittelkonsum widmet, von 42,5% auf 9,6% seit dem Beginn des 20. Jahrhunderts (Chao und Utgoff, 2006; Clauson, 2014). Mit den vielen Möglichkeiten für Verbraucher, ihr hart erworbenes Geld auszugeben, frustriert die scheinbar geregelte, unmoderne – und ländliche – Natur der Lebensmittelproduktion etwaige Versuche, Verbraucher davon zu überzeugen mehr als nötig zu bezahlen – beziehungsweise mehr als sie es gewohnt sind. In Kürze scheint der vermutlich selbstverständliche Glaube daran, dass ein höherer Lebensstandard bedingt, weniger für Nahrungsmittel auszugeben, sich im Kern der Ökonomie des Lebensmittelkonsums verankert zu haben.

An dieser Stelle muss gefragt werden, warum selbst angesichts der neuen Herausforderungen für die Produktion von Nahrungsmitteln an einer traditionellen Sichtweise der Lebensmittelindustrie festgehalten wird. Allerdings ist um zu verstehen warum die Auffassungen so sind wie sie sind eine Erklärung dessen notwendig, warum der vorherrschende Ansatz selbst so ist wie er ist. Zu diesem Zweck ist es erforderlich, eine andere Transformation zu betrachten: die historische Entstehung und Evolution der Massenproduktion in der Lebensmittelindustrie. Im Gegensatz zu den traditionellen Methoden der landwirtschaftlichen Produktion ist dieses System durch seine Abhängigkeit von industriellem und technologischen Input gekennzeichnet um erhebliche Gewinne in Effektivität und Produktivität zu erzielen. Speziell vorangetrieben durch die Verbreitung von Großmaschinen, die Elektrifizierung von Erzeugung und Verarbeitung sowie den wachsenden Rückgriff auf Chemikalien in Form von Düngemitteln und Pestiziden schaffte es die fortlaufende Entwicklung dieses Systems während der zweiten Hälfte des 20. Jahrhunderts, Gewinne in der Gesamtproduktivität zu erreichen, die tatsächlich die meisten verarbeitenden Industrien überholten (Clarke, 1994; Gardner, 2002: 28–45). Noch wichtiger ist in Anbetracht der Konzipierung der großindustriellen Produktion zur Bekämpfung der weitverbreiteten Ernährungsunsicherheit, dass deren Entwicklung die Grundlage für eine erhebliche Verlagerung in der ökonomischen und gesellschaftlichen Struktur lieferte. Wenn Verbraucher sich nicht mit den Details der Nahrungsmittelproduktion beschäftigen müssen, ist es daher nicht ein Zeichen dafür, dass die Lebensmittelindustrie traditionell und reif ist – sondern eher ein Zeichen dessen, was durch den Einsatz großindustrieller Methoden erreicht wurde. Im Beispiel der Vereinigten Staaten erlaubt es die Vorherrschaft dieses Systems momentan 322.000 Farmbetreibern (oder 0,001% der Gesamtbevölkerung), 90% der konsumierten Nahrungsmittel bereitzustellen (Conkin, 2008: 164).<sup>6</sup> Aus

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<sup>6</sup> Da die Landwirte ebenfalls einen erheblichen Teil exportieren, ist die Produktionskapazität dieser Gruppe tatsächlich ausreichend um die beträchtliche Nachfrage der U.S.-amerikanischen Verbraucher vollkommen und sogar darüber hinaus zu decken.

diesem Grund gelingt die Vorstellung einer Urbanisierung und Industrialisierung fortgeschrittener Volkswirtschaften nur sehr schwer ohne die Existenz einer konsolidierten und technologisch ausgereiften Lebensmittelproduktion. Trotz ihrer minimalen Beiträge zu ökonomischem Wachstum muss festgehalten werden: “the greatest industrial revolution in our history has occurred, with all its economic benefits and human costs, down on the farm” (Conkin, 2008: x).

Das Vertrauen auf vorgefasste Vorstellungen über die Lebensmittelindustrie spiegelt somit die beständige Bedeutung der industriellen Revolution in landwirtschaftlichen Betrieben wider. In dem Fall da solche Auffassungen überzeugend sind, ist es weil der resultierende Ansatz sich so enorm geschickt in der Adaption an Veränderungen im Kontext der Lebensmittelproduktion zeigen konnte. Im Besonderen bewies sich die Flexibilität der Massenproduktion mehrfach in ihrer Fähigkeit, Qualitäten wie Geschmack, Frische und Bequemlichkeit aufzunehmen, von denen einige einst als gegensätzlich begriffen wurden.<sup>7</sup> Als Ergebnis indiziert die Tendenz, weitere Produktivitäts- und Effizienzoptimierungen anstelle von radikalen Innovationen zu verfolgen nicht notwendigerweise eine mutwillige Profitsuche vonseiten der Unternehmen. Weder noch sollte angenommen werden, dass nur weil der Preis eine wichtige Rolle spielt, Individuen gleichgültig gegenüber den Produktionsbedingungen ihrer Nahrungsmittel sind. Stattdessen reflektiert die Bedeutsamkeit von Preis, Produktivität und Effektivität die stillschweigende Anerkennung dessen, was durch die Verfolgung solch nebensächlicher Faktoren als eigenständige Ziele erreicht werden kann. Trotzdem ist jedoch die Persistenz dieses Status Quo immer dadurch bedingt, wie erfolgreich diese Bemühungen für die Lösung der wesentlichen Herausforderungen der Lebensmittelproduktion bleiben.

## Die Untersuchung von Verbraucherverhalten und Transformation in der Lebensmittelindustrie

Im Umgang mit den neuen Herausforderungen für die Produktion von Lebensmitteln bleibt das implizite Vertrauen darin, dass die Massenproduktion das Fundament für Transformation in der Lebensmittelindustrie darstellt unverändert stark. Obgleich die heute bedeutsamen Herausforderungen eine dahinschwindende Ähnlichkeit zu den historisch relevanten aufweisen, fördert das etablierte Vermögen

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<sup>7</sup> Siehe Harvey et al. (2002: 194-196) für eine interessante Diskussion über die Restrukturierung, die in den „Temporalitäten“ von Produktion, Vertrieb, Einzelhandel und Verbrauch erforderlich ist, um die neue Qualität der „hergestellten Frische“ bereitzustellen.

dieses Systems, günstige Ergebnisse zu erreichen und derweil Verbesserungen in Produktivität und Effizienz anzustreben die Wahrnehmung, dass ein deutlicher Wandel unnötig sei. Entsprechend wird versucht, zuvor exklusive Aspekte alternativer Systeme (zum Beispiel aus der ökologischen Landwirtschaft) mit dem vorherrschenden Ansatz in der Lebensmittelproduktion zu versöhnen.<sup>8</sup> Ein Historiker behauptete sogar die Existenz einer generellen Annahme: “our overall system of farming, which developed over the last century, is beyond challenge” (Conkin, 2008: 173).

Dennoch wird das Erbe der industriellen Revolution in der Lebensmittelproduktion mit Sicht auf den Schweregrad von Problemen wie Fettleibigkeit, Lebensmittelsicherheit, Klimawandel und Umweltschädigung immer mehr in Frage gestellt. Im Gegensatz zum impliziten Vertrauen welches die Literatur durchzieht, hegt die wahrgenommene Beziehung solch anhaltender Probleme mit der industriellen Agrarwirtschaft Misstrauen unter den Verbrauchern – was immer mehr Individuen dazu bringt, sich mit alternativen Systemen zu beschäftigen. Es ist daher fraglich, ob so viel Aufmerksamkeit der Erforschung gewidmet werden sollte, wie eingekürzte Versionen dieser alternativen Systeme in den vorherrschenden Ansatz einfließen können. Anstatt schwer integrierbare Aspekte gänzlich abzulehnen scheint es plausibel zu sein, dass alternative Ansätze innovative Lösungen für die neuen Herausforderungen bieten, mit denen sich Gesellschaften konfrontiert sehen. Die Fähigkeit alternativer Netzwerke, Wandel in kleinem Umfang zu fördern wurde bereits bezüglich des Wiederaufbaus lokaler und regionaler Nahrungsmittelsysteme belegt (Gillespie et al., 2007). Es ist also eine Überlegung wert, ob das Streben nach der umfassenden Bewältigung all der weitreichenden Probleme der Lebensmittelindustrie das Vertrauen in das dominante System widerspiegelt, seine Mängel zu überwinden (z.B. durch die Integrierung von Elementen aus alternativen Ansätzen) – oder die Schwierigkeit, sich alternative Lösungen im Angesicht des anhaltenden Einflusses des vorherrschenden Systems vorzustellen.

Bezüglich der letztgenannten Möglichkeit ist aussagekräftig, dass die transformative Wirkung alternativer Systeme wie zum Beispiel der biologischen Landwirtschaft oft mit der Begründung abgetan wird, dass es ‘nicht die Welt ernähren kann’. Ungeachtet der anderen relevanten Ziele suggeriert dies, dass jenen Zielsetzungen Vorzug gegeben wird, die in herkömmlicher Weise für die Lebensmittelproduktion relevant waren. Auch während die Wichtigkeit weltweiter Ernäh-

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<sup>8</sup> Siehe Andersen (1994) für eine Diskussion über die Anwendung von „use-functionality specifications“ in der Lebensmittelindustrie um für Qualitätsverbesserungen zu sorgen und gleichzeitig die Veränderungen an existierenden Produktionsprozessen zu minimieren.

ahrungssicherheit außer Frage steht ist es nicht unbedingt klar, warum sie eine höhere Priorität einzunehmen scheint als der Klimawandel oder die Adipositasproblematik. Ist es aufgrund der Relevanz eines so schwerwiegenden Problems wie Nahrungsknappheit auf der globalen Ebene? Wenn ja, kann das gleiche für eine ganze Anzahl von Zielsetzungen inklusive Klimawandel gesagt werden. Könnte die Vorrangstellung globaler Ernährungssicherheit auf ethische Gründe hinweisen, da Nahrung eines der wesentlichen Elemente des Lebens ist? Obgleich dies ein valider Punkt ist, muss darauf hingewiesen werden, dass dieses Item auf der internationalen Agenda genauso jung ist wie die Sorgen über Klimawandel und zunehmende Fettleibigkeit – was in gewisser Weise die Kraft dieses Arguments untergräbt.<sup>9</sup> Anstelle dessen kann vermutet werden, dass die prominente Rolle weltweiter Ernährungssicherheit für die Zukunft der Lebensmittelproduktion sehr wahrscheinlich von deren hoher Übereinstimmung mit der ursprünglichen Konzeption der Aufgabe des existierenden Systems abstammt. Unter all den für die Lebensmittelproduktion relevanten Herausforderungen ist es im Besonderen diese, welche sich als einmalig kompatibel mit dem vorherrschenden Ansatz erweist. Deren Stand verdeutlicht somit auf eine weitere Weise den durchdringenden Charakter vorgefasster Meinungen in der Lebensmittelindustrie.

Aufbauend auf dieser Erklärung, warum weltweite Ernährungssicherheit so hervorgehoben wird kann des Weiteren argumentiert werden, dass alternative Systeme und Netzwerke nicht aufgrund einer generellen Unterlegenheit weitgehend außer Acht gelassen werden, sondern weil sie explizit in der Erreichung jener Ziele unterlegen sind, die wir gelernt haben mit der Lebensmittelproduktion zu assoziieren. Um die Bedeutung alternativer Systeme und Netzwerke korrekt einschätzen zu können, müssen unsere vorgefassten Vorstellungen im Licht des sich verändernden Klimas in der Lebensmittelproduktion einer Überprüfung unterzogen werden. Da wir uns nicht länger in einem Kontext bewegen in dem Erwartungen überwiegend durch Ernährungssicherheit geformt werden, wird immer öfter insistiert, dass die Lebensmittelindustrie ihren Part bei der Bewältigung von Zielen wie zum Beispiel der Verminderung des Risikos einer Klimaveränderung, der Aufrechterhaltung einer sicheren und stabilen Nahrungsmittelversorgung sowie der Förderung von Gesundheits- und Ernährungsverbesserungen spielen muss. Transformation in der Lebensmittelindustrie kann somit nicht angemessen im Sinne von Produktinnovation, Umstrukturierung der Lieferkette oder selbst vom

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<sup>9</sup> Obwohl das ‘Recht auf Nahrung’ zuerst durch die Allgemeine Erklärung der Menschenrechte im Jahr 1948 festgehalten wurde, wurde die Bedeutung der Bekämpfung von Hunger und Mangelernährung zum ersten Mal 1974 auf der ersten Welternährungskonferenz in Rom deklariert: “Every man, woman and child has the inalienable right to be free from hunger and malnutrition in order to develop fully and maintain their physical and mental faculties.” (United Nations, 1975).

Entstehen alternativer Systeme ausgedrückt werden. Vielmehr ist jeder dieser Aspekte eine Begleiterscheinung der grundlegenden Transformation, welche momentan im Rahmen der Rollenzuschreibung der Lebensmittelproduktion in modernen Gesellschaften stattfindet.

Entstehend aus den sich verlagernden gesellschaftlichen Erwartungen bezüglich dieser Industrie ist ein größeres Potential dafür vorhanden, den Aktivitäten der Produktion und des Konsums von Nahrungsmitteln neues Leben einzuhauchen. Anstatt einer Industrie, die sozusagen in den Ruhestand versetzt werden sollte, bietet die Lebensmittelindustrie einen paradigmatischen Fall für die Erkundung, wie genau sich Spannungen und Widersprüchlichkeiten über die Zeit entwickeln. Um auffällige Vorurteile auszugleichen ist es daher wesentlich eine Perspektive von Transformation zu liefern, welche die ausgesprochene Einmaligkeit der jüngsten Entwicklungen ausreichend hervorhebt und darauf basiert ist. Aus dieser Sicht haben nur wenige Perspektiven das Potential, solche Einsichten in die Veränderungen in der Lebensmittelindustrie zu geben wie jene, in dessen Mittelpunkt die Evolution des Verbraucherverhaltens im Laufe der Zeit steht. Generell gesagt tritt die wachsende Komplexität und zunehmende Politisierung des Konsums jedoch als Artefakt der industriellen Revolution in der Lebensmittelproduktion in den Hintergrund. Der Glaube daran, dass die fehlende Bereitschaft mehr für Nahrungsmittel auszugeben eine zwangsläufige Folge eines höheren Lebensstandards ist, verleiht der Bestrebung nach Transformation des Verbraucherverhaltens außerdem ein Gefühl der Zwecklosigkeit. Und doch zeigt die langfristige Abnahme des relativen Ausgabenanteils für Nahrungsmittel Anzeichen einer Bewegung in die entgegengesetzte Richtung (Clauson, 2014). Aus diesem Grund kann angenommen werden, dass es dank des verstärkten Überdenkens der Bedeutung des Lebensmittelkonsums möglich wird, neue Quellen der Wertschöpfung für eine der essenziellsten Aktivitäten des Lebens abzuleiten.

Damit potentielle Veränderungen im individuellen Verhalten letztendlich realisiert werden können sind dennoch zahlreiche entgegenkommende Entwicklungen des breiteren Regimes erforderlich. So bringen beispielsweise neue Erwartungen bezüglich der Qualität von Lebensmitteln nicht nur Veränderungen im Produktionssystem welches die Qualität liefert mit sich, sondern auch Veränderungen in den Institutionen des Einzelhandels und im breiteren regulatorischen Umfeld, damit die Existenz dieser Qualität in einer glaubhaften Art kommuniziert werden kann. In dieser Hinsicht bietet die Erforschung der Evolution des Verbraucherverhaltens einen Blick auf die Grundlagen der Transformation in der Lebensmittelindustrie – beispielsweise ob die politischen Initiativen, die innerhalb des Regimes



unternommen werden, sich überhaupt auf der Ebene der Individuen effektiv durchsetzen. In Hinblick auf das Verhalten von Verbrauchern wird der Versuch unternommen, eine neuartige Perspektive sowohl für eine Transformation auf Systemebene innerhalb der Lebensmittelindustrie einzurichten, als auch für die besondere Rolle der Individuen innerhalb dieser größeren Prozesse. Hinsichtlich der Förderung nachhaltiger Gesellschaften dient die sich entfaltende Beziehung zwischen Individuen und ihrer Kost als ein unentbehrlicher Mikrokosmos für die Erforschung dessen, was für die erwünschte umfangreichere Transformation erforderlich ist.

## Umfang und Struktur der Dissertation

Die Beziehung zwischen Verbraucherverhalten und Transformation in der Lebensmittelindustrie motiviert die Doktorarbeit als Ganzes. Im Lichte der Komplexität dieses Sachverhaltes ist es jedoch entscheidend, die verschiedenen Aspekte dieser Beziehung nur einen nach dem anderen zu betrachten. Aus diesem Grund wird die große Bedeutung des Verbraucherverhaltens in den nächsten vier Kapiteln auf mehrere Arten zum Ausdruck gebracht. Jedes Kapitel repräsentiert in dieser Hinsicht eine spezielle Illustration dafür, wie Einblicke in das Verhalten von Verbrauchern auf die typischen Fragestellungen bezüglich Transformation in der Lebensmittelindustrie angewendet werden können.

Angesichts der Fülle an Perspektiven, die bereits innerhalb dieser Diskussion existieren scheint es ratsam die Ausarbeitung eines weiteren Ansatzes zu vermeiden, der letztendlich und wahrscheinlich unnötigerweise die Verunsicherung im Kontext von Transformation in der Lebensmittelproduktion verschärfen würde. Stattdessen versucht diese Dissertation einen synthetischen Ansatz zu entwickeln indem sie sich sukzessive mit zwei verschiedenen Literaturen beschäftigt, die beide eine Erklärung jeweils nur eines Elementes der Beziehung zwischen Verbraucherverhalten und Transformation liefern: (1) die interdisziplinäre Literatur über Nachhaltigkeitsübergänge (engl.: *sustainability transitions*); und (2) die vorwiegend psychologische und ökonomische Literatur über die Determinanten nachhaltigen Lebensmittelkonsums. Während sich erstere typischerweise auf Entwicklungen auf Systemebene konzentriert, behandelt die zweite eher Erläuterungen auf Ebene der Individuen. Dank ihrer sehr unterschiedlichen Stärken scheint es sehr wahrscheinlich, dass Erkenntnisse aus beiden Literaturen sich gegenseitig ergänzen können – vorausgesetzt mögliche Uneinigheiten können versöhnt werden. Und da die zwei Literaturen außerdem den Hintergrund für die jeweiligen Ab-

schnitte bereitstellen, ist es als Vorbereitung für die folgenden Kapitel nützlich, einige ihrer zentralen Merkmale zu beschreiben.

Der erste Abschnitt, der die Kapitel 2 und 3 umfasst, beschäftigt sich direkt mit der wachsenden Literatur zu Nachhaltigkeitsübergängen mit dem Ziel, den Kern solcher Übergänge zu explorieren. Um den Wechsel zu nachhaltigeren Gesellschaften zu unterstützen, wird typischerweise die Wichtigkeit gezielter Verbesserungen in Wirtschaftssektoren wie Energie, Verkehr und Ernährung hervorgehoben (Markard et al., 2012). Es wird daher implizit davon ausgegangen, dass nachhaltige Gesellschaften am ehesten durch Verringerung der Umweltauswirkungen jener Branchen erreicht werden können, bei denen auch die größten Reduktionen möglich sind. Während dieser Ansatz weitgehend erfolgreich dabei ist, Aufmerksamkeit auf jene wirtschaftlichen Tätigkeiten zu richten die angegangen werden müssen, ist er bezüglich der Art und Weise wie darin Übergänge verfolgt werden nicht immun gegen Kritik. Im Besonderen wurde der deterministische Tonfall der hin und wieder solche Diskussionen begleitet aus dem Grund moniert, dass er die Möglichkeit einer Meinungsverschiedenheit über das Aussehen nachhaltiger Gesellschaften vernachlässige (Garud et al., 2010; Raven, 2006). Es ist jedoch gerade wegen der Neuheit der Herausforderung, die beträchtlichen Umweltprobleme anzugehen, dass es bezüglich der Frage wie ein solcher Übergang angestrebt werden soll anhaltende Unsicherheit gibt (Smith et al., 2005). Inmitten des Interesses auf Systemebene an technologischen Rahmenbedingungen und Wirtschaftssektoren wird oft vergessen, dass das Potential, die Umweltauswirkungen einer Gesellschaft zu minimieren deutlich davon abhängt ob eine Verhaltensänderung auf Ebene der Individuen stattfindet oder nicht (Lachman, 2013). Zumal Konsumgewohnheiten in Ländern mit hohem Einkommen einen erheblichen Einfluss haben, ist die größere Wertschätzung von individuellem Verhalten für eine solidere Grundlage von Nachhaltigkeitsübergängen unabdingbar.

Um die Beziehung zwischen Verbraucherverhalten und Transformation zu konturieren ist es wichtig, zuallererst den generellen Ansatz von Nachhaltigkeitsübergängen zu überdenken. Hierzu untersucht Kapitel 2 wie ergiebige Konzeptionen von individuellem Verhalten die Übergangsbestrebungen zu Gesellschaften mit einem geringeren schädlichen Umwelteinfluss beraten und anleiten können. Zu diesem Ziel nutzt dieses Kapitel die umfangreiche Literatur zu umweltrelevantem Verhalten um herauszuarbeiten in welche Weise Verhaltensänderungen für Nachhaltigkeitstransformationen von Wichtigkeit sind. Es wird an erster Stelle festgehalten, dass ein verhaltensbezogener Ansatz ein breiteres Spektrum von potentiell bedeutenden Determinanten berücksichtigen kann. Zum Beispiel ist es im Gegen-

satz zur typischen Betonung von technischen Änderungen und Preissubventionen möglich, die Relevanz individueller Gewohnheiten und sozialer Normen für die Forschung von Nachhaltigkeitsübergängen zu untersuchen. Zur übersichtlichen Präsentation dieser Erkenntnisse wird anschließend ein konzeptueller Rahmen entwickelt, der die komplexen Verbindungen zwischen individuellem Verhalten und den vielzähligen Kontextebenen innerhalb derer es sich ausdrückt darstellt. Zusammengefasst zeigt das Kapitel auf, wie eine umfangreichere Konzeption von individuellem Verhalten die Forschung zu Nachhaltigkeitsübergängen durch die Verdeutlichung der verschiedenen Wege auf denen Verhaltensänderungen verfolgt werden können ergänzen kann.

Kapitel 3 nimmt sich daraufhin der Lebensmittelindustrie an um die Wichtigkeit von Verbraucherverhalten intensiver zu explorieren. Speziell motiviert durch das nachlassende Vertrauen und die geringere Zuversicht in die U.S.-amerikanische Lebensmittelindustrie forscht dieses Kapitel nach, warum es sich als so schwierig herausstellt Probleme bezüglich gesundheitlicher Unbedenklichkeit und Sicherheit von Lebensmitteln sowie Umweltschädigung anzugehen. Mit Blick auf die wachsende Assoziation zwischen anhaltenden Problemen und industrieller Produktion wird außerdem die Frage gestellt, warum solche Schwierigkeiten gerade in letzter Zeit aufgekommen sind und auch, warum sie sich im Laufe der Zeit zunehmend verschärfen. In dieser Hinsicht wird die wachsende Bewusstheit der anhaltenden Probleme als Ansatzpunkt für Diskussionen über die Notwendigkeit von Transformation in der Lebensmittelindustrie gesehen. Wegen der fundamentalen Rolle der dominanten Massenproduktion wird die Struktur der persistierenden Probleme speziell mit Hilfe einer historisch-informierten Systemanalyse dieses Regimes überprüft. In diesem Ansatz resultieren anhaltende Probleme aus dem Festhalten an ‘Erfolgsfaktoren’, die in der Vergangenheit für die Entstehung und Evolution des Regimes instrumentell waren (Schuitmaker, 2012). Dementsprechend sind Problemstellungen wie Lebensmittelsicherheit und die Auswirkungen auf die Umwelt gerade deswegen so schwierig zu lösen, weil diese Erfolgsfaktoren so tief in den Strukturen der Lebensmittelindustrie verwurzelt sind und fortlaufend durch einzelne Akteure verstärkt werden.

Obgleich einige Parallelen zur Literatur über Nachhaltigkeitsübergänge und dessen Rückgriff auf die Theorie der Strukturierung erkennbar sind (vgl. Geels, 2004; Giddens, 1984) muss unterstrichen werden, dass historisch-informierte Systemanalysen wegen der größeren Betonung der Handlungen Einzelner eine alternative Perspektive erlauben. Sobald die Schwerpunktsetzung auf Großproduktion und wissenschaftliche Expertise aus einer akteursorientierten Sichtweise betrachtet

wird, wird klar, dass ihre Wichtigkeit innerhalb der industriellen Lebensmittelproduktion nicht allein im Sinne von Effizienz und Produktivität erklärt werden kann. Anstelle dessen wird durch die Analyse aufgedeckt, dass solche Aspekte Bedeutung erlangten aufgrund ihrer Relevanz für saliente Bedrohungen, die Verbesserungen der gesundheitlichen Unbedenklichkeit und Sicherheit von Lebensmitteln limitierten – insbesondere Qualitätskontrolle und Produktkonsistenz. Folglich sind die wirtschaftlichen Vorteile durch groß angelegte und wissenschaftlich fachkundige Innovationen in Technik und Organisation nicht ausreichend um Transformation in der Lebensmittelindustrie zu realisieren. Anstelle dessen muss das Potential für die Einrichtung einer Verbindung zwischen Produktionsmethoden und bestehenden Qualitätserwartungen ebenfalls berücksichtigt werden.

Nach der Auflösung einiger falscher Vorstellungen über die industrielle Produktion von Lebensmitteln wird diese Perspektive sodann angewandt um zu klären aus welchen Gründen das Vertrauen im Laufe der Zeit absinken konnte. Während sich die Qualitätserwartungen bezüglich der Lebensmittelproduktion weiter entwickeln, sind die lang-etablierten Erfolgsfaktoren immer weniger dazu im Stande den Verbrauchern Produktqualitäten kundzutun. Anstelle dabei zu helfen, die angesprochenen Problemstellungen zu lösen scheint das anhaltende Vertrauen in sie als Grundlage für innovative Handlungen die Probleme nur zu verschlimmern. Bezüglich des problematischen Rufes der industriellen Lebensmittelproduktion wird somit impliziert, dass der ausschließliche Verlass auf ausgetretene Strategien nicht länger möglich ist um mit dem sich verändernden Klima der Lebensmittelproduktion Schritt zu halten. Das Kapitel endet aus diesem Grund mit einer Untersuchung der breiteren Relevanz dieser Erkenntnis für die Transformation in der Lebensmittelindustrie, speziell mit Berücksichtigung der potentiellen Rolle alternativer Systeme.

Nachdem der Grundstein für Transformation gelegt wurde nimmt der zweite Abschnitt mit den Kapiteln 4 und 5 die spezifische Relevanz von alternativen Handelsformaten genauer in Augenschein. Das Thema der Nachhaltigkeitsübergänge beiseite stellend strebt dieser Teil an, einen Beitrag für die umfassende Literatur zu den Determinanten ökologischen und ethischen Konsums zu leisten. Im Allgemeinen eint die Studien dieser Literatur das Streben danach, besser zu verstehen warum Individuen sich für oder gegen den Kauf solcher Produkte entscheiden. Hinsichtlich des Übergangs zu nachhaltigeren Gesellschaften wird die zugrundeliegende Motivation Verhaltensänderungen in Richtung größerer Nachhaltigkeit zu fördern oftmals offenkundig. Viele Studien sind als Ergebnis generell darauf ausgerichtet, eine Verbindung zwischen nachhaltigem Konsum auf der einen

Hand und einer Vielzahl demografischer Variablen und psychologischen Faktoren auf der anderen Hand herzustellen. Die Entwicklung dieser Literatur gab dennoch eine Anzahl von Rätseln bezüglich des Zuwachses im ökologischen und ethischen Konsum auf. Für die vorliegende Dissertation werden davon zwei im Besonderen hervorgehoben. Erstens wird beobachtet, dass das Wachstum des nachhaltigen Konsums hauptsächlich durch eine kleine Anzahl an Verbrauchern vorangetrieben wird (Padel und Foster, 2005; Pearson et al., 2011). Versteckt durch die Betonung des extensiven Wachstums solcher Märkte passiert daher die gerühmte Verlagerung im Verhalten der Konsumenten nur ungleichmäßig über Individuen. Die Bewusstheit dieses Puzzles ermutigt oftmals Versuche, einen Link zwischen dieser Vielfalt von Verbraucherpräferenzen und speziellen individuellen und kontextuellen Faktoren zu finden. Obwohl die daraus resultierenden Erklärungen letztendlich eine große Bandbreite an Themen und Disziplinen kreuzen, so entsteht die zweite Art von Rätsel durch die Tendenz, eines der zentralen Merkmale von Transformation in der Lebensmittelindustrie abzutun: das (Wieder-)Aufkommen alternativer Handelsformate. Als Resultat und trotz der zunehmenden Diskussion darüber, dass die Einkaufsstätte ein wesentlicher Einflussfaktor für Bio-Konsum ist (Thompson und Kidwell, 1998; Zepeda und Li, 2007), gibt es im Grunde keine weitere Berücksichtigung dessen, warum der Typ des Handelsformats wichtig ist.

Mit dem Ziel die Präferenzheterogenität in diesem Gebiet zu explorieren macht das Kapitel 4 von einem hypothetischen diskreten Entscheidungsexperiment (engl.: *discrete choice experiment*, DCE) mit Verzichtsoption Gebrauch um speziell die Beziehung zwischen Handelsformaten und nachhaltigem Tomatenkonsum zu untersuchen. In diesem Ansatz werden Individuen vor eine Reihe von Entscheidungsaufgaben gestellt in denen sie gebeten werden, zwischen Produkten mit verschiedenen Attributen zu wählen. Im Allgemeinen erlaubt der Rückgriff auf ‘Stated-Preference’-Methoden wie diese, individuelle Unterschiede in der Zahlungsbereitschaft (engl.: *willingness to pay*, WTP) für Produktqualitäten wie lokal, Fair Trade und ökologische Produktion herauszufinden. Durch die Integration des Handelsformats ist es außerdem möglich zu etablieren, warum genau der Typ des Handelsformats wesentlich ist. Speziell berücksichtigt diese Studie zwei potentielle Mechanismen, durch welche die Art des Handelsformats von Bedeutung ist. Erstens, entsprechend der Möglichkeit, dass die Art des Handelsformats einen direkten Einfluss ausübt, werden drei unterscheidbare Formate in die Entscheidungsaufgabe mit aufgenommen: Discounter, Supermarkt und Bio-Markt.<sup>10</sup> Zweitens, indem auch potentielle Interaktionen zwischen Handelsformat und den ver-

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<sup>10</sup> Der letzte dieser drei repräsentiert ein Beispiel eines alternativen Handelsformats und ist daher nützlich, um deren potentielle Signifikanz für ökologischen und ethischen Konsum zu illustrieren.

schiedenen Qualitätsattributen bedacht werden, wird die Wahrscheinlichkeit untersucht, dass Handelsformate über die Wertigkeit solcher Qualitäten das Verhalten der Verbraucher beeinflussen. Zusammengefasst reflektiert dieses Kapitel eine sorgfältige Überprüfung inwiefern wo ich einkaufe beeinflusst, was ich kaufe.

Zum Abschluss bietet das Kapitel 5 einen Versuch die Präferenzheterogenität auf dem Gebiet des nachhaltigen Konsums aus einer motivationalen Perspektive vertiefend zu erforschen. Im Speziellen möchte dieses Kapitel erklären, warum manche Individuen mehr dazu im Stande sind, die für den Kauf von Bio-Kost scheinbar notwendige Leidenschaft und Energie zu finden. Umfragestudien die sich mit den Determinanten umweltbewussten Verhaltens beschäftigen, finden zwei vorwiegende Arten von Erklärungen. Zum einen wird von der Motivation der Verbraucher in einer Weise berichtet, die als Erklärung bestimmte Charakteristiken von Individuen hervorhebt. Generell gesagt verhalten sich Individuen eher nachhaltig, weil sie eine angeborene höhere Motivation dazu haben – eine recht tautologische Aussage. Zum anderen kamen mit der Erkenntnis, dass individuumsfokussierte Erläuterungen allein eher nicht ausreichen, zusätzlich kontextorientiertere Beschreibungen von Motivation auf. Mit einer Betonung der involvierten Kosten hebt diese Art von Erklärung hervor, wie bestimmte Kontexte eine unterstützende Rolle für ein Verhalten spielen, indem sie es bequemer und weniger kostenaufwendig machen. Es wird somit davon ausgegangen, dass Individuen dazu ermuntert werden könnten sich in einer nachhaltigeren Weise zu verhalten – wenn es nur einfacher wäre.

Nichtsdestotrotz gibt es wegen der Betonung relativ statischer Merkmale von Motivation einen limitierten Rahmen zur Erforschung der Entstehung schwieriger Verhaltensweisen im Laufe der Zeit. Wenn es dazu nicht nur um Transformation in der Lebensmittelindustrie, sondern auch um Transformation des Verhaltens Einzelner geht, ist es “not sufficient to make them *do it*, or to explain *why* they do it [but] to explain the variations in the *energy* that people put into this endeavor” (Thøgersen, 2005: 159). Entsprechend ist es hinsichtlich eines nachhaltigen Konsums von Lebensmitteln bedeutsam nicht nur jene passionierten Verbraucher zu identifizieren, sondern potentielle Erklärungen für die Entstehung dieser Leidenschaft anzubieten. Aus diesem Grund muss Aufmerksamkeit auf die dynamische Beziehung zwischen Individuen und Handelsformaten gelenkt werden um umfassend auszudrücken, wie letztere die persönliche Motivation beeinflussen kann. Durch den Gebrauch von Einsichten aus der psychologischen Motivationsliteratur kann argumentiert werden, dass die anhaltende Interaktion mit bestimmten Han-

delsformat-Typen einen potentiellen Mechanismus darstellt durch den die Qualität der Motivation gesteigert werden könnte. Im Gegensatz zu den zwei in der Literatur prävalenten Erklärungen gibt diese Schilderung die Bedeutung einer konstitutiveren Beziehung zwischen Motivation und Kontext wieder. Der Artikel endet mit einer empirischen Illustration, welche die Konsequenzen des Gebrauchs einer der beiden begrenzteren Formen dieser Beziehung zur Modellierung individuellen Verhaltens untersucht. Indem dahingehend das Potential, politische Empfehlungen irrezuführen demonstriert wird kann abgeleitet werden, dass das Verständnis von nachhaltigem Konsum von einer detailgenaueren Erforschung der Beziehung zwischen Konsument und Handelsformat profitieren kann.





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# Chapter 1

## Introduction

### 1.1 The changing climate of food production

The desire to address problems such as climate change and environmental degradation is pushing societies to consider the types of changes necessary to become more sustainable. Due to the growing awareness of the adverse consequences which are involved, the potential impact of making changes to methods of food production features prominently within such discussions. When it comes to the environment, the shortcomings of the dominant approach can be diversely expressed. The extensive reliance on industrial chemicals such as pesticides and fertilizers, for instance, has been linked to external costs including air pollution, water contamination, and diminishing soil quality (Pimentel, 2009). The importance of reducing environmental degradation is moreover apparent from the fact that approximately a quarter of all groundwater bodies in both the European Union and the United States are found to have poor (and deteriorating) chemical status (EEA, 2012; DeSimone et al., 2014). One of the principal culprits in this regard is pesticide contamination, which accounts for 20% of cases of groundwater contamination in the European Union and a corresponding 16% of those for rivers and transitional waters.

In relation to the possibility of pervasive and irreversible climate change, the agricultural sector as a whole accounts for 22% of global greenhouse gas (GHG) emissions. This emissions share is higher than that produced by the entire transport sector and equals that of all industrial activity (McMichael et al., 2007). Moreover, when considering the broader impact of production-related activities on ecosystems through, for instance, deforestation, the emissions share is

estimated to be closer to 35% (Stern, 2007).<sup>1</sup> Standing out in this respect, the most significant driver of climate change include those activities connected with livestock production, owing to their disproportionate emissions of GHGs with high global-warming potential such as methane and nitrous oxide. The ‘long shadow’ of livestock production thus distinguishes it as one of the foremost contributors to the most severe environmental problems (Steinfeld et al., 2006).

Beyond the particular criticism of livestock production, it is necessary to take into account the cumulative impact of the sundry activities that encompass large-scale industrial food production to appreciate the magnitude of the problems involved. Hence, transformation in agricultural (and forestry) production is established as one of the solutions with the most potential for mitigating climate change, along with improving energy efficiency and promoting renewable energy (Nauclér and Enkvist, 2009). Nonetheless, due to the number of moving parts, the desire to attain a more sustainable food industry is harassed by complexity. To simplify matters, it might be noted that the impetus for transformation is delivered first and foremost by the increasing awareness of the costs of continuing to rely on existing methods of food production. However, in order to understand the external costs of food production, we must extend our focus beyond climate change and environmental degradation, no matter how important these issues are. In fact, in the wake of the increasing attainment of food security, particularly in more developed countries, a growing number of problems have become relevant for food production. An incomplete list of such problems includes: the emergence of an epidemic of obesity; the poor nutritional quality of mass-produced food; the incidence of foodborne illnesses and food scares with difficult-to-forget names like ‘mad cow disease’ and ‘foot-and-mouth disease’; the danger of antibiotic resistance in humans due to overuse in large-scale livestock operations; and ethical concerns relating to animal welfare, the viability of rural communities, and the health and well-being of farm workers.

Similar to the problems afflicting the environment, the substantial costs resulting from the deficient health and safety of the food industry signal the difficulty of proceeding with business as usual. To provide context for the persistent problems in the food industry, the case of the United States is considered throughout this introduction. This is advantageous for two particular reasons: first, the long history of industrial agriculture in this country and, second, the magnitude of the

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<sup>1</sup> Further research has argued that livestock production could account for more than half of all greenhouse gas emissions globally once all aspects of this sector are considered (Goodland and Anhang, 2009).

costs involved. In this regard, the American obesity epidemic stands out given how substantially this challenge diverges from historical concerns in the food industry. In recent decades, the percentage of adults in the United States who are obese or overweight has reached a staggering 35.1% and 69.0%, respectively (CDC/NCHS, 2014). Meanwhile, the medical burden of treating this disease has doubled since 1998 to now amount to \$147 billion – or 10% of all medical spending (Finkelstein et al., 2009).<sup>2</sup> In fact, given the expected increase in obesity prevalence in the future, it is estimated that nearly \$550 billion could be saved over the next two decades simply by keeping obesity at current levels (Finkelstein et al., 2012). Regarding the increasing incidence of foodborne illness, the increasingly risky proposition of food safety impacts confidence in the food industry by fostering “a general state of distrust among consumers” (FAO, 2003: 3). In the United States alone, 48 million cases of food poisoning occur annually (or one for every six Americans), not to mention more grave consequences in the form of 128,000 hospitalizations and more than 3,000 deaths (CDC, 2011). It has thus been estimated that the cost of acute foodborne illness in the U.S. is \$152 billion annually, of which \$39 billion is a result of fresh produce (Scharff, 2010). Furthermore, if the amount which individuals are willing to pay to avoid milder cases is also taken into account, the costs of food safety-related issues might reach upwards of \$1.4 trillion (Roberts, 2007).<sup>3</sup>

As the costs passed on to societies mushroom over time, it becomes difficult to ignore the essential nature of transformation in the food industry. Nevertheless, in spite of the slowly-emerging consensus that changes are necessary, how exactly to tackle the pervasive and persistent problems of large-scale industrial production remains an open issue. On the one hand, given the complexity of this undertaking, it is understandable for numerous and divergent perspectives of transformation to come to the fore. And yet the possibility of paving the way for more sustainable societies is precisely contingent on somehow reconciling the cacophony of distinct viewpoints that exist. As a first step, it is therefore necessary to appreciate what is at the heart of such disagreements, which in turn leads us to reconsider the relevance of large-scale industrial production within the changing climate of food production. Notably, is it sufficient to pursue minimal change to the dominant approach for mass production to reprise its hegemonic position in the food industry or does the emergence of novel challenges such as climate change and

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<sup>2</sup> Since this estimate only covers costs for adults, it does not account for costs related to the nearly 20% of younger individuals between the ages of 6 and 19 who also suffer from obesity-related complications (CDC/NCHS, 2014).

<sup>3</sup> To put this into context, the annual GDP of the United States is around \$15 trillion.

obesity instead demand transformation at a more fundamental level? The upshot is that if, for whatever reason, the re-orientation of food production toward new objectives demands more than transformation in mass production, the task of instituting a solid foundation for transition to more sustainable societies must then consider the potential relevance of alternative approaches as well.

This dissertation is broadly engaged with topics and themes related to transformation in the food industry. In particular, each of the chapters represents a distinct exploration of how change at the level of individual behavior is necessary to establish the potential conditions for transformation. Though often overlooked in the more sweeping transition to sustainable societies, it is argued that the changing relationship of individuals with tasks of food production and consumption provides an essential foundation for such change. Consequently, given both the scope of the phenomenon considered and the novelty of this perspective, it is helpful to provide some general background on the subject of transformation. For this reason, the next section presents a brief overview of notable features that are highlighted when characterizing transformation in the food industry. It is specifically established that the diversity of transformation is manifested by not only further developments in the dominant system of food production but also the emergence of alternative approaches. Since the latter tends to be dismissed, the next section explores the continuing reliance on preconceived notions in the food industry, specifically those stemming from the industrial revolution in food production. However, in response to the changing climate of food production, it is suggested how exploring the evolution of consumer behavior in the food industry affords a useful and distinct perspective of the systems-level developments connected with transformation. The final section outlines the general scope and structure of the dissertation.

## 1.2 The diversity of transformation in the food industry

There is no shortage of questions about how to pursue transformation in the food industry. Answers, however, remain rather contradictory due to the many perspectives of transformation which exist. Promoting a healthier, more sustainable food supply thus hinges crucially on the possibility of making sense of the ambiguity which often reigns in such discussions. Before wading into why transformation is seen to be so challenging, we must thus consider the diverse

understandings of transformation used to describe recent developments in the food industry.

Generally speaking, most perspectives of transformation reflect the historical and continuing prominence of large-scale industrial production in some form or fashion. First, there is frequent mention of the importance of attaining further improvements in productivity and efficiency throughout the supply chain. It is specifically argued that the increasing scale of all food-related activities demonstrates the importance of fostering a greater partnership between large firms at each link in the supply chain (Kaufman, 1999; MacDonald and McBride, 2009). With this objective in mind, transformation can also be pursued at the level of systems of food production and distribution. In particular, the increasing application of information and communications technology is seen to meaningfully impact how the supply chain is organized by paving the way for retailers to take over the crucial tasks of product specification and quality control (Harvey et al., 2002, Ch. 8). In addition to cultivating a new relationship between supply and demand, the greater ability of retailers to offer quality assurances, namely through the use of private standards and labels, opens the door for a fundamental shift from regulation by public authorities to private regulation in the hands of major firms (Busch and Bain, 2004). As a result, these last two developments illustrate why the growing dominance of retailers in global supply chains features prominently when explaining how food production has changed over time.

Nevertheless, focusing exclusively on the current regime runs the risk of overlooking one of the unique aspects of transformation in the food industry: the growing importance of ethical and environmental considerations for food production. Notably, the market for organic food and drink is an increasingly prominent niche sector in this industry. Having grown annually by an average of 20% over last decade, global sales of organic products have increased fourfold to the sum of \$64 billion (Sahota, 2014). Meanwhile, global sales of fair trade products seeking to improve the income security of farmers currently amount to approximately \$8 billion (Fair Trade, 2014). As the largest market for organic food, total sales in the United States recently amounted to an estimated \$35.9 billion which also represents nearly 5% of the entire food industry (OTA, 2015). Furthermore, reflecting the growing familiarity of these products, most families in the United States (81%) now consume organic food at least occasionally (OTA, 2013) and the majority of retail formats (82%) have organic products for sale (Food Marketing Institute, 2008).

On top of the upsurge in alternative production methods, the transformative impact of alternative systems is further expressed by the (re-)emergence of retail formats with an emphasis on shorter supply chains and more personal connections with food producers. As a result, the market in the United States for agricultural products sold directly to consumers has recently surpassed \$1.3 billion (USDA, 2014). Moreover, such growth is accompanied by the advent of novel networks and institutions which help to realize an attractive alternative to the established regime of industrial agriculture. For instance, the number of farmers' markets increased by 150% between 1994 and 2006 alone, while national sales through such channels currently exceed \$1 billion (Brown and Miller, 2008). In addition, innovative arrangements such as community-supported agriculture (CSA) have also emerged with their specific perspective of the relationship between production and consumption. Although practically nonexistent two decades ago, there are now 12,617 CSAs currently operating (USDA, 2014). Among other reasons, such partnerships have proven beneficial for smallholder farmers by making it possible to diminish the risks of agricultural production by selling shares of their final harvest, while providing consumers the opportunity to purchase local produce at an affordable price and support local farmers (e.g. Bougherara et al., 2009). Furthermore, alternative networks are seen to be more generally crucial in order to rebuild local and regional food systems. Rather than a niche concern in the larger food industry, alternative networks therefore represent a 'keystone' for transformation by establishing a viable alternative for farmers and consumers (Gillespie et al., 2007).

### 1.3 Preconceived notions and the legacy of the industrial revolution in food production

In view of the conflicting outlooks of where the food industry might be headed, it is easy to lose sight of what the various perspectives have in common. In spite of their differences, each of the portraits of transformation represents an attempt to explain what is necessary to address novel challenges for food production. And each, by implicitly outlining why such challenges are becoming more prominent, provides a different take on whether, and to what extent, large-scale industrial production is at fault. It might be argued, for example, that the lack of trust in the existing system is the result of so many new objectives becoming relevant at the same time, objectives for which the dominant system was not originally designed.

If so, while indicating that the industrial approach to food production is not necessarily to blame, how likely is it that this system, even with substantial modifications, could both accommodate the new objectives that are important and continue to pursue improvements in productivity and efficiency? Is this task likely to be more feasible through the re-organization of the supply chain? That is, is the possibility of further improvements in traceability and quality control through the increased prominence of retailers sufficient to restore confidence? Or is it difficult to imagine that a system founded on considerations of productivity and efficiency could take on board the diverse and complex set of problems which include dealing with climate change, food safety, and obesity? And, for this reason, could the rise in alternative systems herald a more fundamental transformation founded on the reconsideration of the role assigned to food production in modern societies?

To a large extent, the uncertainty weighing down discussions of transformation reflects the difficulty of knowing how to respond to the new objectives that are relevant for food production. In order to answer the above questions, however, it is necessary to recognize how transformation in the food industry is also made more difficult by the reliance on a range of preconceptions which delimit the possibility of entertaining new solutions to the problems that have emerged. Individuals, whether acting as consumers, policy-makers, or within the supply chain, are likely to identify the changes best able to resolve the novel challenges for food production by considering what has worked before. Whether or not this poses a problem for transformation hinges on the basis of these preconceptions and, moreover, what directions of change are forestalled as a result.

In spite of the increasing popularity of alternative systems, the types of changes which are contemplated tend to be those which either reinforce established principles of the existing system or are easily integrated into it. Relating to product innovation, the unseen boundaries establish a strong bias against radical innovation such that the vast majority (77%) of products introduced each year involve very little or no novelty (Costa and Jongen, 2006).<sup>4</sup> To explain the lack of radical innovation, much of the literature avails itself of a view of the food sector which makes significant change unnecessary. If the sector is beset by substantial competition and the limited potential for innovative success, it simply reflects the type of difficulties that must be navigated within a traditional and mature industry. From the perspective of firms, the presence of such difficulties also explains the tendency to rely heavily on a limited subset of strategies to maximize profits.

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<sup>4</sup> In contrast, only 2.2% of all products introduced are characterized as radically novel.

Notably, in order to cope with the constraints of the ‘traditional’ food industry, viable strategies typically include keeping costs as low as possible, pursuing only minimal change to products and production processes, and a strong reliance on marketing innovations (Galizzi and Venturini, 1996; Traill and Grunert, 1997).

More generally, the preconceived notions relating to a traditional food industry explain why the reliance on a prominent agricultural sector is seen as something to be outgrown. For example, its minimal contributions to employment and economic growth in advanced economies speak to the decreasing importance of this sector as a feature of development.<sup>5</sup> For this reason, it is further rationalized that, even if radical innovations were put forth, consumers themselves are not likely to be interested. Entrenched as a law of economic development (Engel, 1857), the notion endures that increasing levels of per-capita income make it possible to diversify consumption away from, and be less concerned with, essentials such as food. The availability of a dazzling range of innovations and inventions across a number of product categories is thus seen to shift the attention of modern, urban consumers in any number of other directions. As a result, the percent of household income devoted to food consumption in the United States has declined from 42.5% to 9.6% since the beginning of the 20<sup>th</sup> century (Chao and Utgoff, 2006; Clauson, 2014). With so many options demanding their hard-earned consumption dollars, the seemingly settled, unfashionable – and rural – nature of food production frustrates potential attempts to convince consumers to pay more than necessary, or rather more than they are accustomed to. In short, the presumably self-evident belief that having a higher standard of living presupposes spending less on food seems to have been embedded at the core of the economics of food consumption.

At this juncture, it must be asked why adherence to the traditional view of the food industry persists even in the face of novel challenges for food production. However, to understand why perceptions are as they are, it is necessary to explain why the dominant approach itself is as it is. To this end, it is necessary to contemplate another transformation: the historical emergence and evolution of mass production in the food industry. In contrast to the traditional methods used for agricultural production, this system is distinguished by its reliance on industrial and technological inputs to bring about substantial gains in efficiency and productivity. Specifically driven by the diffusion of large-scale machinery,

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<sup>5</sup> Agricultural and livestock production currently contribute a meager 0.7% of GDP and less than 2% of employment in the U.S. (Dimitri et al., 2005), which is in contrast to the turn of the 20<sup>th</sup> century when 60% of the population lived in rural areas and more than  $\frac{1}{3}$  of labor and GDP were tied up in this sector (Council of Economic Advisors, 2006).



the electrification of production and processing, and the growing reliance on the chemical inputs of fertilizers and pesticides, the continued development of this system throughout the second half of the 20<sup>th</sup> century managed to attain gains in total productivity which actually outpaced most manufacturing sectors (Clark, 1994; Gardner, 2002: 28-45). More importantly, given that large-scale industrial production was designed to address the challenge of pervasive food insecurity, its development provided the foundation for a major shift in economic and societal structure. Hence, if consumers need not concern themselves with the specifics of food production, this is not because the food industry is traditional and mature but rather because of what has been achieved through the application of large-scale industrial methods. Taking the example of the United States, the predominance of this system currently enables 322,000 principal farm operators (or 0.001% of total population) to provide 90% of the food consumed (Conkin, 2008: 164).<sup>6</sup> Envisioning the urbanization and industrialization of advanced economies in the absence of consolidated and technologically-sophisticated food production is therefore very difficult. Belying its minimal contribution to economic growth, it must be recognized that “the greatest industrial revolution in our history has occurred, with all its economic benefits and human costs, down on the farm” (Conkin, 2008: x).

The reliance on preconceived notions in the food industry therefore reflects the enduring importance of the industrial revolution down on the farm. If such notions are persuasive, it is because the resulting approach has shown itself to be so proficient at adapting to changes in the context of food production. Notably, the flexibility of mass production has been repeatedly demonstrated by its ability to accommodate qualities such as taste, freshness, and convenience, some of which were once seen to be antithetical.<sup>7</sup> As a result, the tendency to pursue further improvements in productivity and efficiency in place of undertaking radical innovation does not necessarily indicate wanton profit-seeking on the part of firms. Nor should it be presumed for that matter that individuals are indifferent about how their food is produced because price features so prominently. Instead, the significance attached to such ancillary considerations reflects the tacit acknowledgment of what has been attained when pursued as objectives in their own right. Nonetheless, the persistence of this status quo is always contingent on

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<sup>6</sup> Given that farmers also export a substantial amount, it is noted that the production capacity of this group of farmers is actually sufficient to fully satisfy the sizable demands of consumers in the United States and then some.

<sup>7</sup> See Harvey et al. (2002: 194-196) for an interesting discussion of the re-structuring necessary in the ‘temporalities’ of production, distribution, retailing, and consumption in order provide the new quality of ‘manufactured freshness.’

how strongly the fruits of such efforts remain useful for resolving the fundamental challenges confronting food production.

## 1.4 Exploring consumer behavior and transformation in the food industry

When it comes to dealing with the novel challenges of food production, implicit confidence that mass production represents the foundation for transformation in the food industry remains strong. Even as the salient challenges bear dwindling resemblance to those historically relevant, the established capacity of this system to promote beneficial outcomes while aiming at improvements in productivity and efficiency fosters the perception that significant change is unnecessary. Accordingly, attempts are made to reconcile aspects previously exclusive to alternative systems such as organic agriculture with the dominant approach to food production.<sup>8</sup> One historian has even contended that there exists a general presumption that “our overall system of farming, which developed over the last century, is beyond challenge” (Conkin, 2008: 173).

Nonetheless, the legacy of the industrial revolution in food production is increasingly called into question in view of the severity of problems such as obesity, food safety, climate change, and environmental degradation. In contrast to the implicit confidence that pervades the literature, the perceived relationship of such persistent problems with industrial agriculture is fostering distrust among consumers. And, furthermore, since this distrust prompts more and more individuals to take a look at alternative systems, it is debatable whether so much attention ought to be devoted to exploring how to use abridged versions of these systems to mend the dominant approach. Notably, instead of dismissing outright those aspects which prove difficult to integrate, it is plausible that alternative approaches might offer innovative solutions to address the novel blend of challenges confronting societies. The capacity of alternative networks to foster transformation on a small scale has already been evidenced with regards to rebuilding local and regional food systems (Gillespie et al., 2007). Hence, we might consider whether the desire to comprehensively tackle all persistent

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<sup>8</sup> See Andersen (1994) for a discussion of how ‘use-functionality specifications’ are utilized in the food industry to provide quality improvements while minimizing the change to the existing production process.

problems in the food industry reflects confidence in the dominant system to overcome its shortcomings, i.e. by integrating elements of alternative approaches, or instead the difficulty of envisioning alternative solutions given the persistent sway of the dominant approach.

Speaking to the latter possibility, it is informative that the transformative impact of alternative systems such as organic agriculture is often dismissed on the grounds that it ‘cannot feed the world’. No matter the other objectives that are relevant, this suggests precedence be given to objectives which are conventionally relevant for food production. While its importance is beyond dispute, it is not necessarily clear why global food security is a higher priority than, for example, climate change and obesity. Is it because of its relevance to a severe problem like food shortage on a global scale? If so, the same could be said about a number of other objectives including climate change. Might the primacy of global food security then be established on ethical grounds, for instance, because food is one of the basic essentials of life? Though a valid point, it is worth noting that the prominence of this item on the international agenda is just as recent as concerns such as climate change and obesity, somewhat undercutting the thrust of this argument.<sup>9</sup> Instead, it can be proposed that, if global food security features so prominently for detailing the future of food production, it likely stems from how well this objective corresponds to what the existing system has been designed to do. Notably, this challenge, among all those potentially relevant for food production, proves uniquely compatible with the dominant approach. Its standing thus serves as another reflection of the pervasiveness of preconceptions throughout the food industry.

Moreover, building on this explanation of why global food security is emphasized, it can be argued that alternative approaches are largely disregarded not because they are generally inferior for food production but rather because they are inferior explicitly for those objectives that have come to be associated with such activities. To accurately assess the significance of alternative systems and networks, it is therefore necessary to reexamine our preconceived notions in view of the changing climate of food production. No longer lodged in a context where expectations are predominantly shaped by food security, it is increasingly insisted that the food industry play its part in tackling objectives like mitigating the risk of

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<sup>9</sup> Though the ‘right to food’ was recognized by the Universal Declaration of Human Rights in 1948, the importance of eradicating hunger and malnutrition was declared for the first time in 1974 at the first World Food Conference in Rome: “Every man, woman and child has the inalienable right to be free from hunger and malnutrition in order to develop fully and maintain their physical and mental faculties” (United Nations, 1975).

climate change, maintaining a safe and secure food supply, and fostering improvements in health and nutrition at the most essential level. Transformation in the food industry cannot therefore be adequately expressed in terms of product innovation, the re-organization of supply chains, or even the emergence of alternative systems. Rather, each of these aspects is epiphenomenal to the more fundamental transformation that is currently taking place in the role appointed to food production in modern societies.

From the shifting societal expectations, there is greater potential for new life to be breathed into the activities of food production and consumption. Instead of an industry needing to be put out to pasture, the food industry can be seen to offer a paradigmatic case to explore exactly how tensions and contradictions develop over time. To counterbalance notable preconceptions, it is therefore essential to furnish a perspective of transformation that sufficiently highlights and is founded on what is eminently unique about recent developments. In this regard, few perspectives have the potential to provide more insight into changes in the food industry than one centered on the evolution of consumer behavior over time. Generally speaking, however, the growing complexity and increasing politicization of consumption takes a back seat as an artifact of the industrial revolution in food production. What is more, the belief that an unwillingness to spend more on food necessarily follows from having a higher standard of living imparts a sense of pointlessness to seeking transformation in consumer behavior. And yet, echoing the situation of food production, the long-term decline in the relative expenditure share of food is showing signs of moving in the opposite direction (Clauson, 2014). For this reason, it can be hypothesized that the expanding scope to reconsider the meaning of food consumption makes it possible for new sources of value to be derived from one of the most essential activities of living.

Nevertheless, for potential change in individual behavior to ultimately be realized, a host of accommodating developments is required in the broader regime. For instance, novel expectations of food quality potentially bring about change in not only the production system to provide the quality but also retailing institutions and the broader regulatory environment to communicate the existence of this quality in a credible fashion. In this regard, exploring the evolution of consumer behavior affords us a ground-level view of transformation in the food industry, for instance, whether the policy initiatives undertaken throughout the regime are actually effective at the level of individuals. Consequently, using the lens of consumer behavior, we furnish a new perspective on the systems-level transformation of the

food industry and the particular role of individuals within these larger processes. In sum, befitting the aim of attaining more sustainable societies, the evolving relationship between individuals and what they eat therefore offers an indispensable microcosm for exploring the foundations of the broader transformation which we desire.

## 1.5 Scope and structure of the dissertation

Exploring the relationship between consumer behavior and transformation in the food industry supplies the motivation for the thesis as a whole. In view of the complexity of this task, however, it is crucial to consider the distinct aspects of this relationship one at a time. As a result, the broad relevance of consumer behavior is diversely expressed over the course of the next four chapters. In this regard, each chapter represents a particular illustration of how insights related to consumer behavior can be applied to prevailing questions about transformation in the food industry.

That being said, given the plethora of perspectives which already populate this discussion, it seems advisable to avoid simply putting forward yet another approach which ultimately, and perhaps unnecessarily, compounds the uncertainty concerning transformation in food production. Instead, the dissertation attempts to develop a more synthetic approach by successively engaging with two different literatures which each venture an explanation of only one element of the relationship between consumer behavior and transformation: (1) the interdisciplinary literature on sustainability transitions; and (2) the mostly psychological and economic investigations into the determinants of sustainable food consumption. While the first typically concentrates on systems-level developments, the second is more concerned with explanations at the level of individuals. Owing to their widely differing strengths, it seems eminently probable that insights from each can strongly complement the other, that is, if potential disagreements can be reconciled. Furthermore, since these two literatures provide the general background for the respective sections, it is useful to describe some of their central features to set the stage for the chapters that follow.

The first section, comprised of Chapters 2 and 3, directly engages with the growing literature on sustainability transitions to explore the core of such transitions. In order to facilitate the transition to more sustainable societies, it is

the importance of targeted improvements in economic sectors such as energy, transport, and food which is typically emphasized (Markard et al., 2012). As a result, it is implicitly understood that sustainable societies are best attained through reductions in the environmental impact of those sectors where the largest reductions are possible. While largely successful in drawing attention to economic activities which must be addressed, the manner in which transitions are pursued in this approach is not immune to criticism. Notably, the deterministic tone that sometimes accompanies such discussions has been criticized on the grounds that it neglects the potential for disagreement about how sustainable societies should look (Garud et al., 2010; Raven, 2006). In contrast, it is exactly because the challenge of addressing pervasive environmental problems is so novel that there is lingering uncertainty about how transitions should be pursued (Smith et al., 2005). Moreover, amidst the systems-level interest in technological frameworks and economic sectors, it is often forgotten that the potential to lower the environmental impact of societies is broadly contingent on whether or not behavioral change takes place at the level of individuals (Lachman, 2013). Especially given the considerable impact of consumption patterns in high-income countries, the greater appreciation of individual behavior is needed to furnish a more solid foundation for sustainability transitions.

To establish the broad outline of the relationship between consumer behavior and transformation, it is important to first reconsider the general approach of sustainability transitions. In this regard, Chapter 2 specifically explores how a richer conception of individual behavior can inform and guide transitions seeking to lower the overall environmental impact of society. Toward this end, this chapter makes use of the vast literature on environmentally-relevant behavior to understand the manner in which behavioral change matters for sustainability transitions. First and foremost, it is noted that a behavior-informed approach is able to consider a wider range of determinants that are potentially important. For example, contrary to the typical emphasis on technical change and price subsidies, it is possible to explore the relevance of individual habits and social norms for transitions research. To present these insights in an easily manageable form, a conceptual framework is subsequently developed that presents the complex relationship between individual behavior and the multiple levels of context which frame its expression. In sum, it is established how a richer conception of individual behavior can expand the toolbox of transitions research by shining a light on the diverse pathways through which behavioral change can be pursued.

Building on these insights, Chapter 3 looks to the case of the food industry to further explore consumer behavior and transformation. Specifically motivated by diminishing trust and confidence in the American food industry, this chapter inquires why it is proving so difficult to address problems related to health, safety, and environmental degradation. Furthermore, in view of the growing association between persistent problems and industrial production, it is asked why such problems have emerged recently and, moreover, becoming increasingly severe over time. In this regard, the increasing awareness of the persistent problems is taken as the starting point for discussing the need for transformation in the food industry. Given the fundamental role of the dominant regime, the structure of persistent problems is specifically examined via a historically-informed systems analysis of this regime. In this approach, persistent problems result from the continued reliance on “success factors” that were previously instrumental for its emergence and evolution (Schuitmaker, 2012). Accordingly, problems such as safety and environmental impact are difficult to resolve precisely because of how deeply engrained they are in the structure of the food industry and, moreover, continuously reinforced by the actions of individual actors.

While some correspondence with the sustainability transitions literature and its reliance on the theory of structuration is apparent (cf. Geels, 2004; Giddens, 1984), it must be underscored that historically-informed systems analysis offers an alternative perspective given its further emphasis on the activities of individuals. As a result, once the emphasis on scale production and scientific expertise is considered from an actor-oriented perspective, it is revealed that their importance within industrial food production cannot be explained in terms of efficiency and productivity alone. Instead, what emerges from the analysis is that such aspects attained prominence because of their relevance for salient threats which limited improvements to health and safety, notably quality control and product consistency. It therefore follows that the economic advantages from large-scale and scientifically-expert technical and organizational innovation are not sufficient to realize transformation in the food industry. Instead, the potential for a connection to be instituted between production methods and prevailing quality expectations must also be considered.

After helping dispel some misconceptions of industrial food production, this perspective is then applied to clarify why trust might dissipate over time. Notably, as quality expectations for food production continue to evolve, there is greater scope for long-established success factors to be less able to make product qualities known and evident to consumers. Accordingly, rather than helping to resolve any

persistent problems, the continued reliance on them as the foundation for innovative activity only serves to make problems worse. Concerning the problematic reputation of industrial food production, it is therefore implied that it is no longer possible to exclusively rely on well-worn strategies to keep pace with the changing climate of food production. For this reason, this chapter closes with an examination of the broader relevance of this insight for transformation in the food industry, specifically concerning the potential role of alternative systems.

After laying the conceptual groundwork for transformation, the second section, comprised of Chapters 4 and 5, takes a more focused look at the specific relevance of alternative retail formats. Setting aside the topic of sustainability transitions, this section attempts to make a contribution to the wide-ranging literature exploring the determinants of organic and ethical consumption. In a general sense, the studies in this literature hold in common the desire to better understand why it is individuals do (or do not) decide to purchase such products. Regarding the broader transition to more sustainable societies, the underlying motivation to foster behavioral change in the direction of greater sustainability is frequently apparent. As a result, many studies are generally devoted to establishing the association between sustainable consumption on the one hand and a range of demographic variables and psychological factors on the other. Nevertheless, as this literature has evolved over time, a number of puzzles regarding the growth in organic and ethical consumption have emerged. For the purposes of this dissertation, two are highlighted in specific. First, it is observed that the growth in sustainable consumption is chiefly driven by a small number of dedicated consumers (Padel and Foster, 2005; Pearson et al., 2011). Hidden by the emphasis on the extensive growth in such markets, the vaunted shift in consumer behavior is only occurring unevenly across individuals as a result. Mirroring the approach that is common to the literature, the awareness of this puzzle often encourages attempts to link this preference heterogeneity with particular individual and contextual factors. Though the resulting explanations ultimately traverse a wide range of topics and disciplines, a second type of puzzle emerges from the tendency to dismiss one of the central features of transformation in the food industry: the (re-)emergence of alternative retail formats. As a result, and in spite of increasing discussion of how the shopping venue represents a significant determinant of organic consumption (Thompson and Kidwell, 1998; Zepeda and Li, 2007), there remains for all intents and purposes no further consideration of why the type of retail format is important.



To investigate preference heterogeneity in this domain, Chapter 4 utilizes a hypothetical discrete-choice experiment (DCE) with opt-out option to explore the relationship between retail formats and sustainable tomato consumption. In this approach, individuals are presented with sets of choice tasks in which they are asked to choose among products composed of distinct attributes. Generally speaking, the reliance on stated-preference methods such as this one can help explain how individuals differ in their willingness to pay (WTP) for product qualities such as local, fair trade, and organic production. By integrating the type of retail format, moreover, it is possible to establish exactly how the type of retail format is important. In specific, this study considers two potential mechanisms through which retail formats matter. First, expressing the possibility that the type of retail format has a direct impact, three distinct formats are included in the choice tasks: discounters, supermarkets, and independent organic retailers.<sup>10</sup> Second, by also considering potential interactions between retail formats and the various quality attributes, the likelihood that retail formats influence consumer behavior through the value of such qualities is also studied. In sum, this chapter reflects a more careful examination of how where I shop influences what I buy.

Finally, Chapter 5 represents an attempt to further explore preference heterogeneity in the domain of sustainable consumption from a motivational perspective. In specific, this chapter sets itself the task of explaining why some individuals are more able to find the passion and energy seen to be necessary to purchase organic food. From surveying studies looking into the determinants of pro-environmental behavior, two types of explanations are found to predominate. First, there are individual-framed accounts of motivation which highlight particular characteristics by way of an explanation. Generally speaking, individuals who are more likely to behave sustainably are said to do so, somewhat tautologically, given an innately higher level of motivation. Second, in view of the recognition that individual-focused explanations are unlikely to be sufficient on their own, more contextually-enriched descriptions of motivation have also emerged. Stressing the costs involved, this type of explanation highlights how certain contexts exercise a facilitating role for behavior by making it cheaper and more convenient. It is thus understood that individuals might be encouraged to behave in a more sustainable fashion if it were simply made easier to do so.

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<sup>10</sup> Note that the last of these three represents an example of an alternative retail format and is thus useful to illustrate their potential significance for organic and ethical consumption. It can also be remarked that the relevant description of ‘independent organic retailer’ in German is ‘Biomarkt’.

Nonetheless, owing to the emphasis on relatively static features of motivation, there is limited scope to explore how more difficult behaviors emerge over time. Moreover, if we are to speak about not only transformation in the food industry but also transformation in individual behavior, it is “not sufficient to make them *do it*, or to explain *why* they do it [but] to explain the variations in the *energy* that people put into this endeavor” (Thøgersen, 2005: 159). Accordingly, as regards sustainable food consumption, it is important to not simply identify those passionate consumers but rather to provide potential explanations for how this passion has emerged. For this reason, attention must be shifted to the dynamic relationship between individuals and retail formats to fully express how the latter impact individual motivation. Using insights from the motivational literature in psychology, it is argued that the ongoing interaction with specific types of retail formats represents a potential mechanism by which the quality of motivation might be increased. In contrast to the two explanations which are prevalent in the literature, this account expresses the significance of a more constitutive relationship between motivation and context. This chapter closes with an empirical illustration examining the consequences of using one of the two more limited forms of this relationship to model individual behavior. Demonstrating the potential for misleading policy advice, it is therefore concluded the understanding of sustainable consumption can benefit from exploring the relationship between consumer and retail format in greater detail.

## Chapter 2

# Integrating Individual Behavior into Sustainability Transitions

### 2.1 Introduction

Focusing on the global nature of contemporary environmental problems has the potential to make the sizable contributions of individual behavior less evident.<sup>1</sup> Nevertheless, the emissions for which individual households are responsible – whether directly or indirectly – currently account for more than two-thirds of total emissions in high-income countries (Baiocchi et al., 2010). In response, the number of individuals who are willing to do more to protect the environment is similarly on the rise (e.g. Bamberg and Möser, 2007). Given the continuing increase in overall emissions, however, it is increasingly apparent that the importance assigned to sustainability issues is not necessarily represented in how individuals ultimately behave. For this reason, increasing attention is committed to understanding the gap that exists between stated intentions to protect the environment and the actual behavior of individuals (Gifford, 2011). In particular, the limited results produced by environmental attitudes and awareness alone is found to result from the influence of contextual factors that frame individual behavior such as the prevailing institutional, economic, and social environments (Kollmuss and Agyeman, 2002). Consequently, owing to both the confounding effect of contextual factors and the under-consideration of individual behavior as a whole, the expressed willingness of individuals to behave more sustainably

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<sup>1</sup> The paper on which this chapter is based is co-authored with Dr. Christian Gross.

remains a fundamentally under-utilized resource in the search for solutions to sustainability challenges.

Concerning the role of context, however, the importance placed in recent years on cultivating more sustainable societies and economic systems has fostered the emergence of the research domain of sustainability transitions which explicitly considers its importance. In particular, this approach explains how the sustainability of societies can be improved by reducing the environmental impact of key economic sectors such as energy and transportation (Markard et al., 2012). From a methodological point of view, this approach is grounded in the use of socio-technical regimes to explore historical transitions such as that from traditional factories to mass production (Geels, 2006) and the shift from carriages to automobiles (Geels, 2005a). Nonetheless, due to its emphasis on how relatively broad dimensions such as technology, institutions, and organizations co-evolve, this approach is susceptible to a bias towards producers and suppliers when explaining how transitions occur. The role of individual behavior in sustainability transitions has not therefore been fully explored, that is, in spite of the acknowledged significance of individual consumption patterns (e.g. Antal et al., 2012; Lachman, 2013).

What is more, since these transitions are inherently forward-looking in their pursuit of greater sustainability, lingering uncertainty still prevails not only about how transitions should be pursued but moreover whether the emphasis on key sectors will actually translate into the lower environmental impact of society. By representing a bridge across multiple sectors of the economy, how individuals behave becomes important for reasons beyond its important role as a determinant of overall environmental impact. Notably, individual behavior represents a crucial determinant of whether sustainability transitions are ultimately successful. The ability to understand the role of individual behavior for sustainability transitions therefore demands a better appreciation of both the determinants of individual behavior and its complex relationship with the different contextual factors that impact its expression (Stern, 2000).

For this reason, this chapter seeks to enrich the underlying conception of individual behavior in sustainability transitions in order to identify a more diverse set of pathways through which transitions can be pursued. Using the vast literature on environmentally-relevant behavior from the fields of economics, psychology, and sociology, a behavior-informed approach is developed to explain how behavioral change represents the heart of sustainability transitions. The sections of

this chapter are therefore organized to address several of the interrelated questions that might arise. First, how is the behavior of individuals relevant for sustainability transitions (see Section 2.2)? What makes a behavior environmentally significant and, as such, necessary to consider for transitions (see Section 2.3)? How do the determinants which operate within the different contextual levels influence the expression of sustainable behavior (see Section 2.4)? And, finally, how does the presence of interactions among and between determinants and individual behaviors modify the overall effect on environmental impact (see Section 2.5)? By condensing the extensive literature on environmentally-relevant behavior in this fashion, we discuss how it becomes possible to extend the toolbox of existing transitions research by highlighting four novel features of behavior-informed sustainability transitions (see Section 2.6). Finally, Section 2.7 concludes.

## 2.2 Sustainability transitions and individual behavior

The desire to address environmental problems such as climate change and resource depletion is pushing societies to become more sustainable. Given the complexity of this task, however, it is difficult to understand how exactly such transitions should be tackled. For this reason, sustainability transitions typically concern themselves with targeted improvements in key economic sectors such as energy, food, and transport rather than the sustainability of society in general. The emphasis on particular sectors establishes a correspondence with the existing literature on socio-technical transitions. As such, this approach is useful to understand the dynamics leading to the establishment of new sectors, sustainable or otherwise.

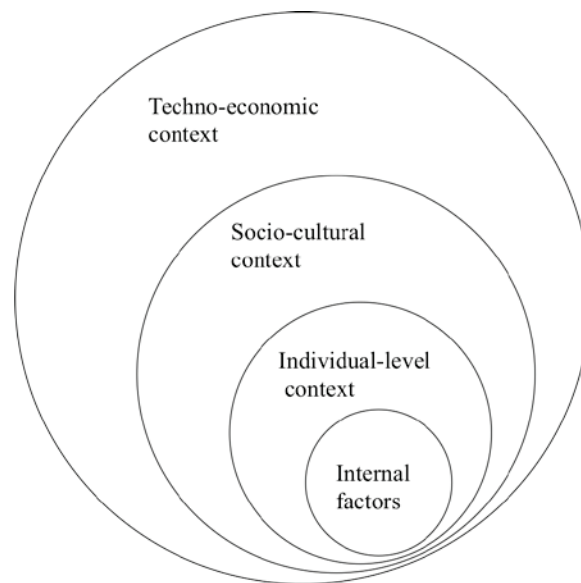
Socio-technical transitions can be characterized rather generally as shifts from one socio-technical regime to another (Geels, 2004) that typically unfold over longer periods of time, that is fifty years or longer (Markard et al., 2012). Examples include the transition from traditional factories to mass production (Geels, 2006) and the shift from carriages to automobiles (Geels, 2005a). Furthermore, the culmination of a socio-technical transition is specifically tied to the internal 'stability' of a socio-technical regime, in which the notion of stability refers to the dynamically stable alignment of various social, technological, and political processes (Geels, 2011). Given the number of processes which contribute to stability, however, it is likely to prove difficult to 'direct' transitions in any

meaningful fashion. Consequently, rather than seeking to engineer specific outcomes, sustainability transitions attempt to understand the types of relationships that operate in existing regime, for instance, how well certain policies, technologies, and institutions act to support or undermine its stability (see Markard et al., 2012).

In spite of the potential relevance of socio-technical transitions, differences emerge when attempting to translate the insights of this literature to sustainability transitions. Most notably, the socio-technical transitions literature has generally benefitted from the added insight that comes with studying historical transitions. Conversely, sustainability transitions are necessarily guided by the forward-looking challenge of addressing pervasive environmental problems (Smith et al., 2005). Besides the limited benefit of historical evidence, moreover, the fact that transitions towards sustainability are presently underway opens up the possibility for potential disagreements concerning how to achieve higher sustainability (Garud et al., 2010; Raven, 2006). Nonetheless, since the goal of achieving the long-run decrease in the overall environmental impact of the economy is common to most approaches, we orient our discussion of sustainability transitions towards this end.

Largely absent from most discussions of sustainability transitions, the role of individual behavior is gaining increasing attention. For instance, Lachman (2013) stresses the inherent difficulty of transitioning towards sustainability without the involvement of individuals in a society. Given the considerable environmental impact of existing consumption patterns in high-income countries, in fact, it is somewhat surprising that the topic of individual behavior has received so little attention. In specific, Verbong et al. (2008) see this as evidence of a strong bias towards producers and suppliers in this literature. Such an argument can in fact draw further support from the lingering application of the term ‘user’ when describing how individuals are relevant in the current approach, namely, solely in terms of how they learn how to use innovative product and technologies. As a notable exception in the literature, the use of practices theory has tended to emphasize the degree of creativity of which individuals are capable when it comes to making use of technology, meaning, and skills to establish their unique responses to policy developments (e.g. Shove and Walker, 2010). Nonetheless, given how it mainly underscores the uncertainty which underlies policy interventions, the insights of practices theory seem more relevant as a cautionary tale for such programs rather than as a means to thoroughly understand individual behavior.

Instead, if we want to explore why individual behavior matters for sustainability transitions, it is necessary to explain the underlying processes of behavioral change. For this reason, the remainder of the chapter develops a behavior-informed approach to sustainable transitions using insights from economics, psychology, and sociology. Mirroring the relevance of the alignment of various sub-regimes for the internal stability of a regime, the determinants found to influence behavior are grouped into three distinct contextual layers. Namely, the higher-order determinants are seen to operate at the level of the techno-economic context (e.g. technology), with those factors at the next level representing the socio-cultural context (e.g. norms), and lastly those factors operating at the more proximate individual-level context (e.g. habits). At the core of this conceptual framework, moreover, there are factors that reflect the inherent desire of the individual to behave sustainably, or not (e.g. attitudes and preferences). These are called internal factors (see Figure 2.1).



**Figure 2.1: Internal and contextual factors of behavior**

Therefore, the ultimate foundation for behavioral change in this framework rests on the internal factors which establish how strongly an individual wishes to engage in a given behavior. As such, the contextual-level determinants are not seen to directly impact individual behavior but rather moderate the likelihood of behavioral change. Furthermore, by grouping the contextual factors in this

fashion, it becomes possible to explore how the relationships that exist among the determinants, whether within a given level or across different levels, also influence the possibility of behavioral change. Overall, this framework therefore portrays how individuals adapt and respond to changes at different levels of context, not to mention why changes in higher-order contextual factors are not necessarily sufficient to realize sustainability transitions. Moreover, by focusing on individual behavior as a whole, a behavior-informed approach to sustainability transitions makes it possible to discuss an individual's impact on the economy in a more integrated and straightforward fashion. Since a wide range of sectors is represented in individuals' shopping baskets, for instance, the changes in the consumption basket purchased illustrate how changes that take place in specific sectors might be offset by the tradeoffs made between sectors.

### 2.3 Environmental significance of behavior

Estimating the overall impact that an individual has on the environment represents a necessary first step for understanding how to promote sustainability transitions. Over the past 50 years, global per-capita emissions have substantially increased from about 3 to 5 tons of carbon dioxide (tCO<sub>2</sub>; own calculations based on World Bank, 2015). In order to provide a somewhat clearer picture of how an individual – as a member of a given society – impacts the environment, measures of the carbon footprints of nations can also prove useful. Concerning the direct and indirect use of resources through consumption behavior, for instance, Hertwich and Peters (2009) calculate that per-capita carbon footprints, at the turn of the millennium, ranged from about 1 tCO<sub>2</sub> among African countries to approximately 30 tCO<sub>2</sub> in the Western world. Nevertheless, although useful for explaining historical developments and the global distribution of environmental impact, the use of such highly-aggregated measures makes it difficult to predict the long-run consequences of behavioral change for environmental impact. In this regard, it needs to be asked whether the fact that a behavior is responsible for a certain level of emissions is sufficient for it to matter for sustainability transitions or if instead some other criteria must also be fulfilled.

Given that the ultimate goal of sustainability transitions is to achieve a long-run decline in overall environmental impact, it follows that for a behavior to be relevant it needs to be able to make this goal closer to being attained. For this reason, this chapter differentiates between those behaviors that have some general



relevance for the environment in terms of emissions, i.e. environmentally-relevant behaviors, and those that are more explicitly meaningful on account of their ability to foster long-run reductions in environmental impact, i.e. environmentally-significant behaviors. The latter concept is specifically developed with reference to Stern (1997, 2000). In this framework, the environmental significance of a behavior is characterized as the extent to which a behavior changes the availability of materials or energy from the environment or alters the structure and dynamics of ecosystems or the biosphere itself. In the first place, this conception stresses how it is not only the level of emissions which are produced that matter for the environment. Moreover, the category of environmentally-significant behaviors includes not only the consumption activities of individuals but also non-consumption activities like environmental activism (see Table 2.1 for an overview). Although the impact of these behaviors is potentially difficult to measure, their environmental significance can be seen from their potential to shape the context in which future choices are made (e.g. Rosa and Dietz, 1998). In order to understand how individual behavior generally matters for sustainability transitions, it is therefore necessary to comprehensively explain how an individual impacts the environment rather than, for instance, focusing only on consumption decisions and related impacts.

**Table 2.1: Categories of environmentally significant behaviors**

| Consumption and conservation behavior  | Production  | Environmental citizenship and other environmental behaviors                    |
|--|---|--|
| - Direct use of resources  | - Home production of renewable energy (e.g. solar panels) | - Environmental activism (e.g. private sphere, within firms and organizations) |
| - Indirect use of resources (e.g. from consumption of food and manufactured goods) | - (Re-) Forestation                                       | - General behavior (e.g. ventilation)  |
| - Recycling and re-use   |   |  |

Given the level of change necessary to attain long-run reductions in environmental impact, moreover, the environmental significance of behavior can be further detailed according to the ease of undertaking behavioral change. There is anecdotal evidence, for instance, that the overall environmental impact of a given behavior is positively related to how deeply the behavior is entrenched in various levels of context. For example, whereas behaviors such as the maintenance of existing technical systems and taking better care of home appliances can be adopted relatively easily, behavioral change in domains that tend to matter more for the environment such as car use, recreational travel, and

home heating and cooling systems proves more difficult for individuals to change (Gardner and Stern, 2008). Consequently, although changing high-impact behaviors is essential for achieving sustainability transitions, the overall significance of this behavioral change for the environment crucially depends on the number of individuals that find such change feasible. The appreciation of behavioral change proves more difficult in some domains thus represents a counterargument against only considering environmental impact when developing strategies for sustainability transitions.

Finally, given that sustainability transitions are accompanied by widespread changes in the existing societal and technological contexts, the potential for a behavioral change to be environmentally significant also depends on its level of persistence over the long run. For instance, a decline in household energy consumption becomes less environmentally significant when it is only the consequence of a temporary shock to energy prices. With respect to the determinants that support behavioral change, it is therefore important to consider how likely it is for the influence of a given determinant to be weakened or negated. As a general rule, underlining the types of interactions that exist between determinants becomes necessary in this respect to predict the likelihood that a behavioral change will persist. What is more, since the potential for interaction effects also extends to the environmentally-relevant behaviors themselves, it is not sufficient for sustainability policy to consider how a single behavior is impacted. Instead, it must be considered how a particular policy instrument impacts all potentially affected behaviors in order to properly evaluate its impact on the environment in the long run (Staats et al., 2004). In contrast, predictions of overall environmental impact that overlook such interactions can be expected to provide a flawed picture of the magnitude and character of change necessary to attain sustainability transitions.

## 2.4 Determinants of behaviors

### 2.4.1 Internal factors

By reflecting how much an individual wishes to engage in pro-environmental behaviors, internal factors such as *preferences*, *attitudes*, and *intentions* occupy the core of our conceptual framework. In this regard, these factors represent the foundation for explaining potential change in environmentally-relevant behaviors.

Meanwhile, the different levels of contextual factors moderate whether or not the influence of these internal factors ultimately becomes expressed in actual behavior (see Table 2.2 for an overview).

**Table 2.2: Determinants of environmentally significant behavior**

| Internal factors                             | Individual-level context   | Socio-cultural context  | Techno-economic context  |
|--|--|---|--|
| - Preferences<br>- Attitudes<br>- Intentions | - Resources (including income and time)<br>- Knowledge and information<br>- Habits<br>- Identity | - Socio-demographic characteristics (e.g. household size and geographical location)<br>- Social Norms<br>- Personal Norms<br>- Values | - Policy and institutions<br>- Technology<br>- Infrastructure<br>- Price |

Both the concept of preferences in economics and the concept of attitudes in psychology describe the value that individuals attach to a particular event or object (Kahneman et al., 1999). Substantial similarities are thus apparent between the two. Owing to matters of discipline, however, notable differences remain. In the case of *preferences*, value judgments are generally expressed in the form of a choice between two (or more) potential alternatives. When the alternatives correspond to a range of products that are more or less environmentally friendly, individual preferences can be ‘revealed’ by observing which product is selected. More specifically, the benefits of environmentally-relevant decisions can be disentangled into a private and a public component. In this regard, an individual’s preference for an energy-efficient fridge, for instance, can be narrowly described, for instance, in terms of the cost savings personally experienced. As already noted, however, the environmental significance of individual behavior extends beyond this type of narrow consideration. For this reason, Kahneman and Sugden (2005) argue for a broader notion of preferences which is conceived as a choice between alternative states of the world. With regard to why individuals might, for instance, prefer an environmentally-friendly product, consequently, the existence of a (hypothetical) comparison between worlds of higher and lower environmental quality can explain the desire to contribute to improving this public good.<sup>2</sup> What is more, this conception also signals how individuals might otherwise express

<sup>2</sup> Note that, depending on the prevalence of higher-order factors such as altruistic values, the individual is not precluded from also obtaining private benefits from making a public goods contribution (Andreoni, 1990).

their preference for environmental quality by choosing to vote for a 'green' party that advocates stricter environmental regulation (Kahn, 2002).

Nonetheless, rather than stretch the concept of preferences to better reflect the value that individuals attach to the environment, it is perhaps more appropriate to consider how else value can be expressed. Unlike preferences, *attitudes* express the degree of favor or disfavor that is associated with particular objects or events (Eagly and Chaiken, 1993). Since attitudes do not have to make a direct comparison between two different states, expressions of attitudes can also be accompanied by an emotional valence in their immediate response to objects (Kahneman et al., 1999). In this respect, these authors argue that, when it comes to environmentally-relevant decisions, the types of judgments that individuals make are more characteristic of attitudes and attitude expression. The expression of positive attitudes towards the environment is therefore found to significantly predict the likelihood that individuals behave pro-environmentally (e.g. Bamberg and Möser, 2007). Moreover, in contrast to the problems confronting the use of preferences, attitudes are also able to better explain the willingness to make a voluntary contribution to protect the environment (Kahneman et al., 1993; Kahneman and Ritov, 1994). This greater relevance of more psychological measures has proven effective in establishing, for instance, the importance of maintaining biodiversity in marine ecosystems (e.g. Spash et al., 2009).<sup>3</sup>

The downside to the greater appreciation of why individuals are ultimately motivated to engage in environmentally-relevant behavior, however, is the diminished understanding of how individuals actually behave. In this respect, *intentions* might be helpful as the link between attitudes and stated preferences on the one hand and individual behavior on the other. In the psychological literature, for instance, intentions are often seen as the immediate antecedents of behavior (Sheeran and Abraham, 2003), while the economic literature similarly portrays intention formation as the mechanism through which consumers are encouraged to establish stable consumption behavior (Sherman, 1980). Nevertheless, if consumers are unable to retrieve existing intentions at the moment of making a decision, the effort devoted to forming intentions could prove fruitless (Shapiro

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<sup>3</sup> The existence of meta-preferences (or second-order preferences) does however signal the potential for greater correspondence that exists between attitudes and preferences (Frankfurt, 1971; Hirschman, 1985). Notably, it is argued that preferences alone cannot describe what individuals decide to consume. Instead, this decision also depends on the preferences of individuals about the types of preferences they wish to have. For instance, while an individual might 'prefer' to take the car when in a rush, this does not rule out the possibility of having a meta-preference for driving less in order to reduce environmental impact.

and Krishnan, 1999). As a result, pro-environmental intentions have therefore proven to be insufficient predictors of actual behavior (e.g. Gatersleben et al., 2002).

While central to understanding why individuals value the environment, this discussion demonstrates that internal factors are not alone sufficient to explain whether environmentally-relevant behavior actually occurs. Concerning attitudes, for instance, the well-established gap between attitudes towards the environment and individual behavior demonstrates that other factors must be considered (e.g. Conner and Armitage, 1998). In order to understand overall environmental impact, it is therefore necessary to consider the types of contextual factors that determine whether or not the internal factors of attitudes, preferences, and intentions ultimately come to be expressed in environmentally-relevant behavior.

#### 2.4.2 Individual-level context

Contextual factors operating at the level of individuals represent one reason why the impact of internal factors such as attitudes and preferences does not actually influence behavior. This can be illustrated through some brief examples concerning the decision of whether to commute to work by car or bike. First, in the case of *income*, access to this resource can determine at a general level the respective quality of car and bike that an individual can afford. While a higher level of income might make it more feasible to have a high-quality bike, the additional *time* pressure that comes with longer working hours could make it necessary to take the car in order to get to work as soon as possible. In order to overcome such costs, the decision to cycle to work might then be contingent on having a sufficiently high level of *knowledge* about the health-related or environmental benefits of doing so. Nonetheless, in spite of whatever intentions might be present, should a countervailing *habit* already exist, namely, to take the car to work each morning, any change in this routine might require the initial investment of significant time and effort. Finally, the decision to cycle to work might depend on the matters of *identity*, notably, whether the individual views himself or herself as a person that cares for the environment.

With regard to *income*, it is often assumed that environmental quality is a normal, or even luxury, good. In this respect, those individuals with larger budgets are better able to care for the environment given that they have more disposable

income to devote (Dasgupta et al., 2002; Kahn, 2002). However, there is growing evidence from empirical investigations of household energy use which illustrate that the level of emissions actually increases with income (e.g. Baiocchi et al., 2010; Druckman and Jackson, 2010). Though having the greater opportunity to engage in environmentally-relevant behavior, there is no guarantee that wealthier households are any more likely to do so. In addition, the potential for income to actually promote more environmentally-harmful behavior can be seen in the case of overall household emissions. Notably, Csutora (2012) finds no significant difference between the ecological footprints of 'green' and 'brown' consumers, that is, in spite of the substantially different attitudes of these two groups. The (negative) effect of income, however, does remain highly significant.

Although higher incomes would seem to make sustainable lifestyles relatively easier, the limited occurrence of certain pro-environmental behaviors such as recycling can be explained by the greater amount of *time* that is required, even if simply to learn how to perform the behavior. The influence of time becomes more complex when one considers how the increasing length of the workday might also have unexpected consequences. On the one hand, the desire to maximize one's limited free time has been associated with the purchase of more time-saving goods which, on account of also being more energy-intensive, produces a less sustainable lifestyle (Devetter and Rousseau, 2011). On the other, the separate problem arises that, even when time is relatively abundant, individuals potentially find themselves lacking things to do. In this respect, the greater consumption of material goods might be utilized to fill up the day and create meaningful passages of time (Csikszentmihalyi, 2000).

Regarding *knowledge*, it is well-established that individuals tend to be badly informed not only about the environmental consequences of their actions but also how to respond should they become aware that a problem exists (Bord et al., 2000; Gifford, 2011). As a result, a frequent assumption underlying information-deficit approaches is that individuals would be better able to reduce their environmental impact if they had access to the relevant information. However, Bamberg and Möser (2007) conclude using a meta-analysis of environmentally-relevant behavior that the greater awareness of environmental problems is not on its own sufficient to reduce environmental impact. Accordingly, it is argued that it is not more but better information that is required, notably, information that is better tailored to individual circumstances and which takes into account individual goals (e.g. Zelezny, 2010).

In light of the limits to information provision, the relevance of existing *habits* helps explain why environmentally-relevant behavior might not be as prevalent as expected. Notably, habitual behaviors that are more strongly established are likely to make changing a behavior substantially more difficult, no matter the level of concern over environmental impact that exists. In this respect, it has been argued that “the defining quality of habit is the automaticity and efficiency of behavior occurring in stable contexts” (Verplanken, 2010: 639). The first part of this definition underscores why habits often prove resistant to behavioral change, while the latter explains how the existing context represents a crucial component of their persistence. Concerning the former, the presence of strong habits is shown to have a countervailing impact on intentions to engage in environmentally-relevant behaviors (De Bruijn et al., 2007; Wood et al., 2005). The influence of habits is also especially pronounced for behaviors which are frequently repeated and relatively easy to perform such as short-distance car usage (Gardner and Abraham, 2008). Nonetheless, the existence of habits is also beneficial given how they reduce the uncertainty associated with decisions that are taken repeatedly over time (Carroll, 2000). As a result, behaviors like recycling or taking public transport become easier for individuals that have already developed a habit for doing so, and in spite of the objective costs involved (Carrus et al., 2008; Verplanken et al., 1998).

Finally, an individual's *identity*, that is, the degree to which she identifies with being, for instance, a ‘green’ consumer, is generally predictive of environmentally-responsible behavior (Sparks and Shepherd, 1992; Whitmarsh and O’Neill, 2010). In fact, the existence of a stronger pro-environmental sense of self explains why some individuals are more likely to engage in non-consumption activities such as environmental activism as well (Fielding et al., 2008). In order to develop a more rounded perspective of identity, research has also explored the relevance of more objective factors such as age and gender. For instance, Wiernik et al. (2012) establish that older individuals are more likely to engage with nature and avoid causing environmental harm. Concerning gender, women are found to not only express stronger pro-environmental attitudes but also more frequently engage in environmentally-relevant behavior (Stern et al., 1993; Zelezny et al., 2000). In order to characterize the greater value that some individuals attach to the environment, moreover, the concept of identity utility is utilized to represent the additional source of utility obtained from those activities and objects that are most relevant for an individual’s identity or self-image (Akerlof and Kranton, 2000). In particular, following Festinger (1957), individuals are seen to be motivated by the desire to minimize their level of mental stress and discomfort through, for

instance, seeking out products and activities that conform to how they view themselves.

### 2.4.3 Socio-cultural context

The significance of the socio-cultural context on individual behavior is broadly captured by the relationship between the individual and the surrounding social environment. Referring to the previous example, whether or not individuals cycle to work can be explained in terms of their current life situation. In specific, *socio-demographic characteristics* relating to number of children and geographic location provide a general measure of the potential for cycling versus driving to work. Nevertheless, if the individual lives in a neighborhood where *social norms* of cycling to work prevail, the commonplace nature of this behavior, as well as subtle pressure to conform, could potentially offset this greater difficulty. Furthermore, the degree to which individuals have fostered a personal sense of responsibility to uphold their *values* and protect the environment, the more likely they will be to cycle to work more regularly, perhaps even opting to forego driving in situations when it might be more convenient or practical.

The significance of *socio-demographic characteristics* such as household size and geographic location provide a general picture of the potential fit between a behavior and the general life situation. For instance, an individual living in a region with a colder climate can be expected to have greater need on average for indoor heating in winter months. Consequently, geographic location and household size have both been established as two of the principal determinants of household energy use, the latter specifically due to the greater energy requirements for cooking and transportation (Hunecke et al., 2007; Jackson, 2005). Nonetheless, while this effect exists for certain behaviors, it does not seem to hold true for environmentally-relevant behavior as a whole (Martinsson et al., 2011). One explanation is how economies of scale make it possible to reduce overall environmental impact by lowering the per-capita costs of pro-environmental behavior. Given how much the effect varies by behavior, therefore, it remains difficult to provide sweeping conclusions about the effect of socio-demographic characteristics on overall environmental impact (Diamantopoulos et al., 2003).



The impact of the social environment on environmentally-relevant behaviors is further demonstrated by the pressure to follow established *social norms*. Generally speaking, norms represent customary rules of behavior that coordinate interactions with others and are useful in fostering social organization.<sup>4</sup> The decision by individuals to conform to a norm, moreover, makes it easier to gather and process information, especially for unfamiliar behaviors (Cialdini et al., 1990). However, since normative information can be provided for both desirable and undesirable behaviors, the impact of norms ultimately depends on what the norm communicates for individual behavior (Cialdini et al., 2006). In this regard, another crucial aspect of social norms is the implicit pressure exerted on individuals to follow the example set by their peers. For instance, when individuals were informed about the average energy use of other members of their community, their behavior tended to conform to the norm, regardless of what this denoted for overall energy usage (Schultz et al., 2007). More generally, the pressure to conform to existing norms has proven effective in encouraging individuals to undertake environmentally-relevant behaviors such as littering (Cialdini et al., 1990; 1991), public transportation (Heath and Gifford, 2002), recycling (Schultz, 1999), and water conservation (Aronson and O’Leary, 1983). In fact, Welsch and Kühling (2009) determine that the example set by the consumption patterns of significant others, i.e. friends, neighbors, and relatives, is the most significant determinant of individuals’ decision to consume organic food, as well as having the overall explanatory power of attitudes, price, income, and socio-demographic variables combined.

In addition, some individuals can be seen as using the somewhat exclusive quality of some environmentally-relevant products to set an example while signaling their status and generosity. In particular, the greater prevalence of costly and visible behaviors such as owning a hybrid vehicle has been explained as individuals “going green to be seen” (Griskevicius et al., 2010). Instead of exerting a uniform effect on all involved, however, the influence of the social environment can also vary by individual depending on what is seen to matter most. The persuasiveness of social norms, for instance, specifically depends on whether individuals have internalized the feeling of obligation or responsibility that is communicated to establish *personal norms* (Schwartz and Howard, 1981). The existence of this deeper sense of responsibility has been subsequently utilized to more richly

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<sup>4</sup> A further distinction is made regarding the kind of information that is provided. Specifically, descriptive norms communicate how others tend to act in a given context, while injunctive (or prescriptive) norms attach a sense of approval or disapproval when expressing what ought to be done (Aronson et al., 2012).

explain the different tendencies that individuals have to engage in environmentally-relevant behavior (Bamberg and Möser, 2007; Harland et al., 1999; Manstead, 2000).

Whereas norms provide information about specific behaviors, *values* provide a general account of how individuals perceive themselves to be related to the people and places around them. In this respect, the degree to which individuals endorse, for instance, egoistic, altruistic, or biospheric values describes the relative importance attached to outcomes that affect themselves, other people, and the broader environment, respectively. Notably, the more individuals care about other humans, other species, and the broader environment - and less about themselves alone - the more likely they are to engage in environmentally-relevant behavior (e.g. Stern and Dietz, 1994). Generally speaking, values have proven useful as a determinant of a variety of environmentally-relevant behaviors (De Groot and Steg, 2007; Nordlund and Garvill, 2002). More specifically, values are able to explain the greater likelihood for certain individuals to perform more public behaviors such as voting and environmental activism which typically tend to evade explanation by norms alone (Stern et al., 1999).

#### 2.4.4 Techno-economic context

Both the types of consumption alternatives that are available to consumers and the overall structure of incentives under which such decisions are taken can be said to be generally determined by the techno-economic context. This level of context is therefore composed of both the significant *policies and institutions* that constitute the wider frame of individual behavior and the general structure provided by *technology, infrastructure* as well as the (relative) *prices* of goods and services. Referring to our previous example, policy instruments can be designed to incentivize cycling by subsidizing the purchase of bicycles, while advances in technology might make cycling generally feasible for a wider range of activities, e.g. via the development of electric bikes. Furthermore, improvements in cycling-friendly infrastructure can further increase the attractiveness of cycling by, for instance, building wider gaps between cycle paths and automotive traffic to provide an increased sense of safety. Finally, in a more general sense, the effect of the techno-economic context can also be seen to function through the cumulative effect on prices such that the increasing (relative) price of gasoline provides further incentive to cycle to work.

With regard to *policy and institutions*, various policy mechanisms have been implemented to increase the incidence of environmentally-significant behavior. In general, such mechanisms can be distinguished into two categories: those seeking to directly impact individual decision-making, for instance, through the use of environmental labeling schemes; and those such as the Emissions Trading Scheme in the European Union, which affect individual behavior more indirectly, namely, via the types of goods and services generally supplied by companies. In addition, at a more global level, signatory agreements such as the Kyoto Protocol, which commit countries to baseline emissions-reduction targets also represent an important feature of the overall institutional framework. However, though it is certainly the case that the importance of institutional reforms for reducing environmental impact is well-established (e.g. Arrow et al., 1995), it cannot be more generally concluded that the fact that wealthier countries tend to have a lower environmental impact necessarily results from their having more developed institutions. Instead, it has been established that the lower energy intensity of developed countries is often the consequence of taking advantage of the weaker institutional contexts of developing countries in order to offshore a major share of their energy-intensive production (e.g. Gross, 2012; Peters et al., 2011). To give an example, while domestic emissions have decreased in signatory countries to the Kyoto Protocol, this has not been accompanied by smaller carbon footprints but rather an increase in the relative share of imported emissions (Aichele and Felbermayr, 2012).

The importance of *technology*, meanwhile, is most clearly apparent in the potential for energy-saving technological progress to reduce the energy intensity of particular goods or activities. Whatever the particular consumption patterns of individuals, technical advances such as low-flow showerheads and efficient water heaters substantially reduce household energy consumption (Dietz et al., 2009). With regard to time-saving technologies, Brencic and Young (2009) argue that the growing market penetration of such technologies for general household use is expected to affect not only household energy use but also the allocation of time between home production and leisure activities. Since the gains from greater productivity are often utilized to purchase more material goods rather than increase leisure time, the decision of how to re-allocate time is another significant determinant of overall environmental impact (e.g. Reisch, 2001).

The relevance of the existing *infrastructure* is broadly apparent in relation to the availability of pro-environmental products and perceived inconvenience of undertaking pro-environmental activities such as recycling. Pertaining to the

former, it has been argued that the relative inconvenience of provisioning a particular product, such as organic food, helps explain why the availability of resources such as income and time is not alone sufficient to foster consumption (Scholderer and Grunert, 2005). The impact of infrastructure on perceived inconvenience has also been established in the case of behaviors such as recycling (Knussen et al., 2004; Ölander and Thøgersen, 2006).

Discussions of how *price* influences environmental impact are frequently conceived in terms of the price elasticity of demand of an environmentally-harmful good and the cross-price elasticity between an environmentally-harmful good and its potential substitute. To give an example, Brons et al. (2008) conclude that, under normal circumstances, both the mean short-run and long-run price elasticities of gasoline are not very sensitive to a change in price. Furthermore, the significance of price considerations is also demonstrated by the multiple studies, which have investigated the cross-price elasticity between gasoline prices and vehicle purchases (e.g. Gallagher and Muehlegger, 2011). With regard to the potential effectiveness of price signals for environmentally-relevant activities, it is further noted that energy prices do not accurately reflect all external costs in the presence of subsidies and tariff regulations (Linares and Labandeira, 2010). However, since customers have difficulty assessing the actual costs of their behavior, their ability to foster improvements in environmental quality is substantially reduced.

## 2.5 Behavioral interactions

### 2.5.1 Interactions among determinants

One of the most important realizations in behavioral research is that changes in higher-order contextual factors may affect the lower-order context in which individual decision-making takes place. As a consequence, the success of policies seeking to reduce overall environmental impact generally depends on their ability to understand the interactions that take place between contextual determinants and individual behaviors. In this section, we utilize the examples of the *direct rebound effect*, *motivation crowding out*, and *habit discontinuity* to demonstrate the relevance of such complex interactions for understanding sustainability transitions.

With regard to the techno-economic context, for instance, the development of more energy-efficient technologies, by making energy use cheaper, could paradoxically undermine efforts to reduce energy emissions. Notably, the potential for consumer demand to increase in the wake of such improvements might offset the immediate gains from energy efficiency. If such a *direct rebound effect* is large enough, it might therefore be expected that energy savings never actually materialize. Recent literature reviews have concluded, however, that the extent of the rebound effect in consumption domains such as household energy use and transportation typically amounts to less than one third of overall gains (Gillingham et al., 2013; Sorrell et al., 2009).

There is further debate in the literature regarding how individuals might respond to the implementation of certain policies. In our framework, questions about how policies are likely to be perceived can be represented in terms of an interaction between internal factors and factors operating at the level of the techno-economic context. In particular, since monetary incentives such as deposit-refund systems are a fundamental tool in environmental policy, it is important to consider how such incentives potentially influence more intrinsic sources of motivation (Bowles, 2008; Deci et al., 1999). The threat of *motivation crowding out* is illustrated through the diminishing significance of altruistic values, ethical norms, and other pro-social preferences for individual behavior in the presence of external rewards (Frey, 1997; Frey and Oberholzer-Gee, 1997). In part, this phenomenon results from the belief that peers will ultimately attribute individual behavior to the pursuit of monetary rewards in such situations, whether or not this is actually the case. Using experiments performed in rural Colombia, Cardenas et al. (2000) demonstrate that providing monetary payoffs to resolve an environmental dilemma actually tended to reduce social welfare by crowding out other-regarding behavior. However, Bowles and Polanía-Reyes (2012) clarify that, so long as policies are suitably designed, it is also possible to ‘crowd in’ individual motivation. For this to be the case, it is shown that individuals need to maintain a sense of being internally motivated to engage in sustainable behavior, that is, rather than driven by external economic rewards alone (e.g. Green-Demers et al., 1997; Pelletier et al., 1999).

Having looked at the interactions between the techno-economic context and the other layers, it is helpful to consider the potential for interactions between the socio-cultural and individual-level contexts. In this regard, the implications of the *habit discontinuity hypothesis* help to illustrate how a change in the socio-cultural context, by disrupting an individual’s habits, can open a window for behavioral

change to take place (Verplanken and Wood, 2006; Verplanken et al., 2008). Notably, since habit formation depends on people repeating actions in a set of stable circumstances, changes in the socio-cultural context that result from, for instance, moving to a new city can facilitate changes in habitual behaviors. Concerning overall environmental impact, it can therefore be argued that fostering changes in situational contexts can be much more impactful than seeking to promote pro-environmental attitudes (e.g. Wood et al., 2005). For this reason, many studies consider the effectiveness of more structure-oriented strategies for behavioral change such as the temporary closure of a freeway (Fujii et al., 2001) and the gifting of a one-month free bus ticket (Fujii and Kitamura, 2003). In both examples, individuals are found to be much more sensitive to information provision as a result of the change. Similarly, Bamberg (2006) establishes that individuals who had just re-located to an urban area could be encouraged to increase their use of public transportation rather easily, namely, by offering them free service along with the relevant schedule information. In addition to facilitating change in habits, moreover, changes in the socio-cultural context have the potential to activate more general values towards the environment. Among university employees who had recently moved, for instance, it was concluded that the subset of participants who were environmentally concerned *and* had recently moved tended to commute to work by car less frequently (Verplanken et al., 2008). However, the fact that behavioral change becomes possible implies neither that pro-environmental behavior will increase nor that more environmentally-destructive habits might be created. Again, the ultimate consequences for individual behavior depend on the nature of the interactions between the different contextual layers in which the behavior is embedded.

### 2.5.2 Behavioral spillovers

Beyond the interactions that underlie the relationship between individual behavior and the broader aspects of context, further interactions are present among the different behaviors themselves. Numerous studies in the literature have therefore taken aim at systematically explaining how environmentally-relevant behaviors are interrelated. In this respect, the discussion of behavioral spillovers reflects how a change in one behavior might foster a further increase or decrease in environmental impact through its effect on other behaviors. With regard to sustainability transitions, behavioral spillovers can be relevant in one of two ways. On the one hand, if the environmental significance of two behaviors is positively

related, i.e. a change in context causes their respective environmental impacts to move in the same direction, the overall environmental impact from changing one behavior will be greater than would be expected when spillovers are omitted. Conversely, the greater frequency of a behavior whose environmental impact is negatively related to that of another would see a smaller-than-expected change in overall impact, for better or worse. In this section, we focus on two examples of positive spillovers – the *indirect rebound effect* and the *foot-in-the-door effect* – and two examples of negative spillovers – *self-serving bias* and *self-licensing bias*.

The *indirect rebound effect* – or re-spending effect – is notable for its emphasis on the potential impact that a change in a particular behavior can have on other behaviors. Recall that the direct rebound effect considers the unexpected consequences of a decline in prices in the context of a single consumption domain. In contrast, the indirect rebound effect describes the possibility for spillovers across (at least) two different consumption domains when the income savings in one domain are used to purchase more goods in another. From another perspective, this effect thus considers the net result of the income and substitution effects for all the other goods and services purchased by the household (Chitnis et al., 2013). For instance, Chalkley et al. (2001) show that, after accounting for the possibility that monetary savings are spent on other products and services, nearly a third of the environmental benefits of purchasing an energy-efficient fridge-freezer and installing a high-efficiency domestic boiler disappear. Nevertheless, in examining the transportation domain, Murray (2013) concludes that the consequences of the indirect rebound effect, while important, still fall well short of completely offsetting potential gains. Furthermore, even after including deliberate saving behaviors such as driving fewer kilometers by car and turning down the thermostat, Antal and van den Bergh (2014) still find the rebound effects for different types of fuel consumption to represent less than a quarter of initial savings. In fact, the indirect rebound effect proves to be particularly important for overall environmental impact when there is a substantial difference in the level of environmental significance of the two behaviors. For instance, Druckman et al. (2011) calculate the size of indirect rebound effects for a combination of three abatement actions by UK households to be approximately one third. However, when re-spending is more strongly weighted towards goods and services with a low level of pollution intensity, the size of the rebound effect is only half as large.

Moreover, the possibility that rebound effects are lower than expected can also be explained in terms of the *foot-in-the-door effect*. In specific, it is argued that the adoption of a single pro-environmental behavior could eventually produce more ambitious and significant shifts in other behaviors as well (Thøgersen and Ölander, 2003; Whitmarsh and O'Neill, 2010). In this regard, it has been illustrated how the direct and immediate savings in energy consumption can foster the emergence of both other related energy-saving behaviors and higher knowledge levels regarding energy conservation (Abrahamse et al., 2007). In the case of less environmentally-significant behaviors, moreover, the potential for certain behaviors to act as a catalyst for further behavioral change provides some clarity on the extensive amount of attention devoted to promoting behaviors such as recycling. Although not likely to be environmentally impactful on their own, such behaviors become significant due to the indirect impact that is created through other behaviors. The full measure of environmental significance is only apparent by considering how further reductions in environmental impact occur through channels other than those that might be usually expected.

The downside of behavioral spillovers is that behavioral change in one domain can spill over negatively as well. In particular, research into environmental behavior provides two major explanations for why negative spillovers might potentially occur: *self-licensing effects* and *self-serving bias*. With regard to the former, it is argued that individuals might justify not engaging in a particular pro-environmental behavior on the grounds that they have already done enough (Bolton et al., 2006; Tiefenbeck et al., 2013). In this manner, people can be seen to do just enough to maintain their existing self-concepts as environmentally conscious individuals in order to not feel bad about what they have not done. In fact, it is hypothesized that the value of behaving sustainably for individuals is simply to obtain the license to act amorally later (Mazar and Zhong, 2010; Merritt et al., 2010, 2012).

Furthermore, the existence of *self-serving biases* reflects how the decision-making of individuals is potentially influenced by the need to maintain and/or enhance their self-image. In specific, since individuals are likely to dismiss feedback that runs counter to how they view themselves, such biases present an obstacle for environmentally-relevant behavior given the resulting constraints on the information perceived to be relevant and the types of behaviors likely considered to be appropriate. Additionally, the tendency to protect their egos from threat and injury is shown to motivate individuals to focus on what they have personally achieved, perhaps to the detriment of being able to give credit to others involved



(Sherrill, 2008). In the context of environmentally-relevant behavior, this might take the form of believing that one has already done one's fair share to protect the environment, especially in relation to others (Leary et al., 2011). As a result, individuals are less likely to undertake further change in environmentally-harmful behaviors, possibly even explaining their inaction away as the result of having less control over the success of their pro-environmental efforts than their neighbors (Pieters et al., 1998).

In relation to overall environmental impact, meanwhile, the potential differences in the environmental significance of behaviors make the possibility of negative spillovers particularly problematic. Notably, since pro-environmental attitudes are more strongly correlated with low-cost behaviors such as recycling (e.g. Diekmann and Preisendörfer, 1998), even those individuals with pro-environmental attitudes might be motivated to avoid relatively costly environmentally-significant behaviors if more effortless options exist. In support of this, individuals that drive their cars more frequently are more likely to believe that recycling makes up the negative consequences of driving (Bratt, 1999). In fact, Thøgersen (1999) finds evidence of a negative spillover between recycling and the perceived importance of limiting packaging waste, such that individuals feel less obligated to make further changes to their lifestyle. If we wish to improve the sustainability of behavior in general – and not just for a few behaviors – Thøgersen and Crompton (2009) therefore argue that 'simple and painless' changes are not sufficient but that it is instead necessary to 'optimize' the likelihood of positive spillovers while diminishing that of negative spillovers. In other words, the potential for sustainability transitions is fundamentally linked with ensuring that the most beneficial types of behavioral interactions take place.

## 2.6 Discussion

Our review of behavioral research in economics, psychology, and sociology has revealed some of the reasons why individual behavior matters for sustainability transitions. Furthermore, having gathered and discussed this evidence, it is now possible to derive some general implications for sustainability transitions research. In particular, four novel features of behavior-informed sustainability transitions are highlighted: (1) appreciation of the momentum for behavioral change created by factors operating below the techno-economic level; (2) the greater potential for bottom-up sustainability transitions; (3) the deeper importance assigned to

habitual behavior; and (4) re-consideration of the focus on key economic sectors in light of the comprehensive perspective provided by individual behavior.

With regard to the first point, the empirical evidence suggests that momentum for behavioral change is also provided by the influence of factors operating below the level of the techno-economic regime. However, since the transitions literature tends to be more focused on technological and economic factors, the relevance of other factors for sustainability transitions is less considered. As demonstrated by the (indirect) rebound effect, for instance, individuals might respond to the occurrence of energy-saving technological progress by using the savings to purchase more goods. Although it is suggested that the emissions arising from re-spending usually remain substantially less than original reductions, this effect illustrates the problem of assuming that changes in contextual factors foster behavioral change in any sort of direct manner. More generally, given that interactions and spillovers can have either a beneficial or detrimental impact on overall sustainability, it is necessary to understand the influence of internal factors and lower-order contextual factors if we wish to harness this impact to promote sustainability transitions. For instance, it is equally conceivable that individuals re-spend their additional income either on long-distance travel or on less environmentally-harmful goods such as pieces of art. It could be further stated that the groups differ in relation to their pro-environmental attitudes or social environment, the latter group being composed of individuals who, for example, perceive strong social norms against environmentally-destructive consumption to exist. Similarly, it can be hypothesized that the outcome of the rebound effect might depend on socio-demographic characteristics such as the age of individuals or the number of children in a given household. Altogether, this discussion demonstrates how the ultimate impact of technological progress on environmental quality can be predicted with greater accuracy when the countervailing (or reinforcing) momentum produced by such factors is considered.

Second, whereas the majority of the transitions literature presents a top-down approach where change is initiated in the techno-economic context, the potential for 'bottom-up' transitions also deserves attention. In this regard, the specific role of behavioral spillovers must be underlined. Notably, by explicitly taking behavioral interactions into account, the possibility can be explored that behaviors that are relatively insignificant in terms of their direct impact on the environment might be spill over to other behaviors and foster the emergence of other environmentally-significant behaviors. As a result, understanding which individual characteristics and situational conditions act as determinants of

behavioral spillovers would prove useful to promoting sustainability transitions. Increasing attention must therefore be devoted to explaining how to encourage behavioral spillovers, as well as under what set of conditions spillovers might take place.

Third, in contrast to how individual behavior tends to be conceived in the transitions literature, the importance assigned to habitual behavior in environmental psychology stresses that behavioral change often proves exceptionally difficult. In fact, in our literature review, the strength of existing habits represents one of the major obstacles to managing sustainability transitions. Knowledge regarding how automatic behaviors come to be established – and more importantly how they can be changed – is therefore a central element of behavior-informed sustainability transitions. In order for a policy to be successful, it is necessary to make use of ‘downstream-plus-context-change’ interventions that provide informational input directly where habits are most vulnerable to change (Verplanken et al., 2008). As such, it is the change in the socio-cultural context, by temporarily disconnecting individuals from the circumstances in which habits were developed, which makes lasting and enduring behavioral change possible. Nonetheless, the broader implications of changing automatic behaviors via changing contextual factors must also be considered, specifically the kinds of automatic behaviors which might emerge in place of the previous ones. For example, the desire to reduce car use in large cities might be pursued by expanding the extent of the public transport system. Instead of reducing overall environmental impact, however, it might be that the existence of a more developed public transportation network, by making it easier to get to the airport, for instance, could encourage the development of new environmentally-harmful habits in place of the old ones. In spite of the potential benefits from modifying car habits, no firmer guarantee of a reduction in overall environmental impact can be provided so long as the broader context in which this behavioral change takes place is not considered. In fact, all that can generally be said is that the context change opens the space for new habits to emerge, whereas the long-term implications for sustainability remain unclear.

Finally, the integration of behavioral insights into sustainability transitions research raises more fundamental questions about the tendency for sustainability transitions to focus on specific sectors of the economy. The use of this conceptual focus can be linked to the presumption that reducing the environmental impact of key sectors such as transport and energy can improve the sustainability of society as a whole. For reasons already described, however, there is substantial reason to

doubt that the transformation of particular sectors proceeds independently and without affecting other sectors through changes in consumer demand. Notably, from the perspective provided by individual behavior, it can be recognized how the different sectors are more or less interlinked when it comes to decisions related to what goes into one's shopping basket. In particular, due to the possibility of behavioral spillovers, the potential for economic sectors to be interconnected can be stated even more strongly, namely, given how changes in the behaviors that comprise an individual's lifestyle tend to be systematically interrelated as well. If the different sectors are interrelated, however, it becomes necessary to reconsider what a sustainability transition entails. For example, using the criterion of reducing the environmental impact of a specific sector to evaluate sustainability transitions, the transformation of the transport sector might be considered a success by having expanded the public transport system and increased overall ridership. However, the consumers involved, upon becoming aware of that they have behaved sustainably, might feel less obliged to protect the environment and instead decide to finally take that weekend getaway with the family. As a result, it is worthwhile to expand the criteria for a successful sustainability transition to also include, for example, how likely it is that the consumption of a good from a specific sector spills over to increase consumption of goods in other sectors as well. By recognizing the importance of individual behavior, this approach therefore provides a perspective that is complementary to existing approaches to sustainability transitions. Moreover, since non-consumption behaviors such as environmental activism also have the potential to be environmentally significant, the role of individual behavior in sustainability transitions highlights how less-considered sectors such as education might be relevant as well, notably, by creating knowledge about the environmental consequences of behavior and promoting pro-environmental attitudes. Overall, by making sense of the complexity that is characteristic of environmentally-relevant behavior, a behavior-informed approach represents a valuable tool that can help improve the predictability and effectiveness of sustainability transitions.

## 2.7 Conclusions

When it comes to pursuing the transformation of an economy towards higher sustainability, individual behavior can play a significant role in determining whether such efforts are ultimately successful. For this reason, this chapter has sought to integrate the vast literature on environmentally-relevant behavior from

the fields of economics, psychology, and sociology in order to inform sustainability transitions research. Similar to sustainability transitions research, this framework also underlines the role of contextual factors for establishing environmental outcomes. Although discussed here in some detail, the four novel features of behavior-informed sustainability transitions require more extensive consideration in future research. Notably, if the insights from behavioral research are to be leveraged to better inform existing frameworks of sustainability transitions, it is necessary to understand how the respective approaches potentially complement and contradict each other in pursuing their common objective of achieving a low-carbon society.



## Chapter 3

### Persistent Problems and Industrial Food

### Production: A Historically-Informed Systems

### Analysis of the American Food Industry

#### 3.1 Introduction

Growing awareness over the hidden costs of industrial agriculture necessitates a substantial re-consideration of what is required of the food industries of modern societies.<sup>1</sup> Although this discussion might proceed in a number of directions, the need to ‘rethink’ the societal function of food production is most clearly expressed with regards to the number of goals that have become relevant in the last years. In this regard, the EU Commissioner for Agriculture and Rural Development recently offered up a long list of objectives that orient the activities of this industry, including: adapting to climate change; improving resource efficiency; enhancing food safety, variety, and quality; fostering rural development; and maintaining international competitiveness (Hogan, 2015). However, the fact that so many objectives can be identified reflects one of the central difficulties of pursuing transformation in the food industry. Namely, it is possible for there to be as many (if not more) understandings of transformation as goals that demand priority, indicating how such discussions are ripe for disagreement.

In spite of the difficulty of engaging in transformation, it is nonetheless realized that extensive changes are required in the food industry, most notably given the

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<sup>1</sup> An earlier version of the paper on which this chapter is based is available as: “Mass-produced food: The rise and fall of the promise of health and safety.” *Papers on Economics and Evolution* # 1303, Max Planck Institute of Economics (MPI), Jena, Germany.

costs of not doing so. In this regard, it must be highlighted that the significance of the foregoing objectives is inextricably connected to a number of problems needing to be resolved. As reflected by a wave of popular documentaries featuring taglines such as “The Unseen War on American Family Farms” (‘Farmageddon’, 2011) and “You’ll Never Look at Dinner the Same Way Again” (‘Food, Inc.’, 2008), it is increasingly apparent that the achievements of industrial food production have come at a significant cost. As a result, especially in high-income countries such as the United States, the diminishing salience of food insecurity as a prominent threat has paved the way for the greater appreciation of problems like: obesity reaching epidemic-level proportions (CDC/NCHS, 2014); widespread environmental degradation in the form of air pollution, water contamination, and diminishing soil quality (Pimentel, 2009); the increasing occurrence of foodborne scares and scandals with difficult-to-forget names like ‘mad cow disease’ and ‘foot-and-mouth disease’ (Knowles et al., 2007); the emergence of bacterial strains resistant to antibiotics due to their overuse for livestock production; and ethical considerations relating to animal welfare and the economic viability of smallholder farms and rural communities.

Given the number of problems which have emerged, it is not only the general understanding of food production which must be re-envisioned. Rather, the continued reliance on industrial food production is itself increasingly called into question, especially keeping in mind that the perceived costs of this system have begun to outweigh its benefits. Although any of the above issues might be highlighted, this is perhaps explicated most clearly with regard to food safety. As recently as the 1970s, the topic of food safety was seen to be absent from public and regulatory discussions in the developed nations (e.g. Cooter and Fulton, 2001, for the case of the UK).<sup>2</sup> Recently, however, it has become evident in the United States that not only is the safety of the food supply no longer improving but that it actually seems to be getting worse (Harris, 2009). Accordingly, following a wave of food scares and product recalls, the number of consumers expressing confidence in the safety of the food supply is down to 60% in the United States, with much of the decline having come in recent years (IFICF, 2015). Regarding the human cost of this problem, the threat of food safety is further reflected by the 48 million cases of food poisoning which occur annually (or one for every six Americans), along with more grave consequences in the form of 128,000 hospitalizations and more than 3,000 deaths (CDC, 2011). For the United States

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<sup>2</sup> In this respect, the emphasis devoted to the ‘war on hunger’ in the United States is similarly notable for the implicit confidence expressed regarding food safety (see Nestle and Guttmacher, 1992).



as a whole, it has therefore been estimated that the annual cost of acute foodborne illness amounts to \$152 billion (Scharff, 2010).<sup>3</sup>

Even though calls for the transformation of the food industry have become prevalent in view of the mounting costs passed onto society, broad disagreement remains with regard to how transformation should actually be pursued.<sup>4</sup> In part, the difficulty of tackling novel challenges such as sustainability and climate change can be seen to result from the ‘wicked’ nature of such problems. In specific, many of the problems confronting food production are difficult to resolve given the inability of relying on science or any other objective criteria to establish a definitive description of what is required (e.g. Batie, 2008; Bouma et al., 2011). As a result, since the search for solutions is frequently undermined by drastically differing understandings of the problems themselves, it is difficult to establish a consensus about how to pursue transformation in the food industry, let alone what constitutes success in this regard.

With the nature of the problems involved representing one source of disagreement, it is also necessary to take into account the more specific disagreement regarding how much industrial food production is responsible for the problems that have emerged. For instance, whereas the greater awareness of the hidden costs in terms of environmental degradation and food safety suggests that substantial transformation is needed, it is elsewhere argued that “food has never been safer [even though] the perception is sometimes the opposite” (Nestle, 2013). According to the latter viewpoint, there is a less of a need for significant change in the dominant methods of food production than is commonly assumed. In spite of the shifting societal expectations of food production, the sustained emphasis on the objectives of productivity and efficiency is therefore implicitly understood to form the foundation for ongoing innovative activity (e.g. Kaufman, 1999; MacDonald and McBride, 2009). Moreover, with a gesture toward its historical importance in attaining a safe and secure food supply, it can be noted that the broad presumption remains present throughout academic and policy

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<sup>3</sup> If the amount individuals are willing to pay to avoid milder cases is considered, the cost of foodborne illness rises to upwards of \$1.4 trillion (Roberts, 2007). To put this into context, annual GDP is around \$15 trillion.

<sup>4</sup> For the sake of linguistic diversity, the regime of industrial food production is also indicated throughout the text by names such as mass production and large-scale food production. This simplification is also supported by the popular usage of this term. Furthermore, it is perhaps interesting to note that, while there is frequent mention of the influence of heavy manufacturing on food production, the reverse effect is not as often noted as it perhaps should be, namely since the introduction of assembly-line production for automobiles, for instance, was developed by Henry Ford after the model of the large slaughterhouses and meatpacking plants in Chicago.

debates that “our overall system of farming, which developed over the last century, is beyond challenge” (Conkin, 2008: 173).

Since the significance assigned to transformation is largely defined by the existing perceptions of industrial food production, it is possible to establish such discussions on firmer ground by cultivating a richer understanding of the historical emergence and evolution of this regime. Otherwise, if it is simply presumed that the value of industrial production can be reduced to the pursuit of productivity and efficiency, it remains difficult to evaluate what potential part this regime can play in improving the sustainability and safety of food production, let alone if the technical emphasis of this regime is part of the solution or part of the problem. For these reasons, this chapter seeks to reduce the uncertainty surrounding transformation(s) in the food industry by exploring the relationship between the dominant regime and the problems confronting food production. The problem-centered framework of historically-informed systems analysis is used to gather insights about “the structural properties ... through which enduring problems are reproduced” (Schuitmaker, 2012: 1030). Through the illumination of the historical context in which the emergence of industrial food production occurred in the United States, we are able to clarify the deeper foundations of the problems that exist, and thus why issues such as environmental degradation and food safety have proven so difficult to resolve. Hence, by determining the nature of the connection between the persistence of particular problems and the structure of industrial food production in this nation, the essential conditions that are required for transformation in the food industry to take place can be more clearly established.

Reflecting the broad importance of transformation in the food industry for this chapter, the next section (Section 3.2) surveys the transitions literature to identify some shortcomings regarding how regimes and transformations are typically understood. In view of the gaps in the literature, the merits of a problem-oriented understanding of regimes are developed, with the particular relevance of the methodological framework of historically-informed systems analysis being highlighted. Using this approach, Section 3.3 elaborates a historical account of the emergence of industrial food production in the United States to explore why and how prominent features of this regime came to be seen as ‘success factors’. Then taking up the continuing evolution of this regime, Section 3.4 considers how, owing to the shifting societal expectations of food production, the continued emphasis on these success factors increasingly results in the incidence and persistence of various problems. Having illuminated the relationship between

industrial food production and persistent problems, Section 3.5 synthesizes the main insights to broach the topic of conditions necessary for transformation, before concluding with some broader implications for transformation in the food industry.

## 3.2 Theoretical and methodological considerations

Highlighted by the use of a systems-level perspective, an extensive amount of research has emerged to explain broad developments in the economic and technological evolution of industrialized countries over the last two centuries. It must be remarked from the outset that approaches of this type are principally interested in understanding how economies evolve over time, not how a particular innovation diffuses within a given economic context. In view of the complex and interconnected nature of economic evolution, it is therefore necessary to construct explanations in terms of systems of innovation rather than single innovations that bring to bear a number of relevant factors. Moreover, by establishing the features or principles which remain more or less stable even as substantial change is taking place, the reliance on systems – or similar notions like regimes and paradigms – to conceptualize long-term shifts in the structure and orientation of economies is able to cut through some of the inevitable complexity. As such, the ability to impose stability and consistency on processes of transformation represents one of the principal advantages of systems-level frameworks.

### 3.2.1 Understandings of regimes and regime transformations

The literature on regime transformations is as complex as the transitions it attempts to study. Notably, owing to the number of features that can be used to describe complex systems, there is no shortage of explanations – or sources of possible disagreement – regarding how and why economic and technological evolution proceeds as it does. In this regard, many distinct frameworks populate the literature, and each, whether emphasizing the role of technologies, institutions, or the societal context, is founded on its own understanding of what guides and orients such processes. Given the general origins of this literature in economics, it is perhaps not surprising that two of the earliest regime-founded approaches – technological paradigms and techno-economic paradigms (TEP) – feature a strong

emphasis on technological factors. In the first framework, the periods of discontinuous change that are characteristic of economic evolution are said to reflect the emergence of a new paradigm (Dosi, 1984). The onset of such a paradigm is seen to profoundly alter the set of (technical) problems and solutions considered as relevant within a given economy. In this regard, it is thus the development of technological knowledge and scientific principles that represents the central driver of economic change. In the second framework, meanwhile, the periodically-emerging waves of innovation are linked to the increasing availability of key factors such as steel, oil, and microelectronic equipment (Freeman, 1991; Perez, 1985, 2010). In fact, such factors are so crucial within this approach that the expression of the technological and institutional environment is also contingent on the salient key factor. It is understood that the broad objective in any given TEP is to apply the best technical and organizational knowledge available in order to exploit the cheapness of a particular key factor. Hence, along with improving the productivity and efficiency of technical methods, the further development of the 'best' practices for organizations and institutions is seen to represent an additional objective of innovative activity.

In spite of their substantial differences, these two accounts both emphasize the importance of technical change, and moreover change that is motivated to attain improvements in efficiency and productivity. The most salient difference arises, however, from the deeper significance assigned to the relationship between technical innovation and the institutional environment within techno-economic paradigms. Notably, Freeman (1991: 229) argues that the breakthrough of a radical innovation is contingent on "a complex process of matching and mutual adjustment between pervasive new technologies, the built environment, and the organizational and technological environments." While innovation still occupies a prominent position, it is underscored that the realization of scale economies and cost efficiencies does not occur in isolation from the societal context. Even in a framework heavily focused on technical considerations, it can therefore be seen that a novel technology, in order to be effective, must adapt itself to the extant environment, and at the same time foster conditions that are more supportive for its success.

Nevertheless, the process by which the 'stabilization' of this new environment occurs is not readily apparent nor is an explanation forthcoming for why a specific technology is selected instead of another, or for that matter, why one ultimately succeeds while another fails. It might be generally remarked in this regard that the limited consideration of both the 'lock-in' of a technology and the wider relevance

of the selection environment is made possible by the greater certainty that is entailed with case studies of historical transformation. However, if we wish to develop a richer appreciation of transformations of a more forward-looking nature, it is vital to consider how the selection environment is relevant in greater detail, especially in order to establish the conditions which support a radical innovation to be stabilized. In this regard, Green et al. (1999: 782) remark that “a technology is not chosen because it is efficient, but becomes efficient because it has been chosen.” As a result, citing the ‘deterministic overtones’ regarding processes of selection (Geels, 2011: 26), technology-centered descriptions of regimes have been criticized for their insufficient interest in the role of the broader socio-institutional environment.

Given that the ultimate success of a technology has much to do with its being selected, it is inherently difficult to explain the emergence of new regimes strictly in terms of productivity and efficiency. That is, since improvements in these aspects are an outcome of the continued evolution of a regime and its core technologies, it is necessary to look elsewhere to ascertain the reasons why a regime emerges in the first place. As a potential solution in this regard, it is suggested that rather than envisioning technical innovation as an isolated process, this activity must be seen as deeply embedded within existing structures of social relations. Accordingly, the framework of socio-technical systems of provision is explicitly founded with attention to the “strong relationship between innovation in socio-economic arrangements and innovation in the material products and processes in which they are entwined” (Green and Foster, 2005: 664). It is implied as a result that the perceived significance of an innovation, and therefore why it is selected, potentially varies because of the unique meanings with which it is invested across contexts. As such, it is difficult to singularly rely on best practices or technological principles to understand regime transformations when such factors remain insufficient to explain why a specific practice or technology is (or is not) ultimately selected.

For this reason, it is necessary to establish the particulars of the relationship between regime and societal context more clearly. Toward this end, a new conceptual level has been proposed to understand the relationships which represent the core of regimes. In specific, a variety of ‘meso-level’ approaches have underlined how aspects such as extant market arrangements and prevailing patterns of consumption are also relevant for transformation (e.g. Dopfer et al., 2004; Green et al., 1999; Green and Foster, 2005). In each example, it is the complex interplay between the factors which is seen to establish the ‘deep’

structure in which the decisions of individual actors and firms are made. In other words, explanations of how regimes emerge and become stable over time can benefit from a more comprehensive understanding of the relationships that link the relevant factors to one another.

One prominent example of an approach that seeks to outline the broad societal foundations of transformation is the multi-level perspective (MLP) on socio-technical transitions (Geels, 2004). Generally speaking, socio-technical transitions take as their focus the broad changes that occur in specific industries, concentrating as a result on sectors such as food, energy, and transport rather than the economy as a whole. Moreover, reflecting the importance of regimes in this framework, the long-term transformations regarding the function of an industry are explicitly conceptualized as the transition between two socio-technical regimes.<sup>5</sup> Accordingly, regime transformation is not the result of novel technologies or key factors emerging – for notably exogenous reasons – but instead takes place because the ‘rules’ which represent the foundation of regimes have been established. In particular, the existence of a regime is said to reflect the ‘dynamically stable’ alignment of sub-regimes around a “semi-coherent set of rules that orient and coordinate the activities of the social groups that reproduce the various elements of socio-technical systems” (Geels, 2011: 27–28). The fact that these rules exist and are moreover shared within a broader regime therefore makes it possible for the trajectories that characterize its different dimensions – whether for instance technical, political, or cultural in nature – to be oriented towards a common aim. As a result, insights gained from applying a socio-technical systems approach can be used to explore the explicit stabilizing functions of, for instance, technological and institutional (sub-)regimes with regards to path dependency in a regime and the lock-in of specific trajectories (see Markard et al., 2012). In this respect, the framework of socio-technical transitions provides a more specific and detailed understanding of the constellation of factors that comprise the broader regime.

Besides reflecting how rules serve as the basis for coordination and communication between actors and groups of individuals operating throughout regimes, the framework of socio-technical transitions also expresses the importance of the societal context more explicitly. To be exact, the nature and timing of regime transitions are shown to be contingent on the degree of ‘external

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<sup>5</sup> For this reason, historical case studies represent a common methodological tool for describing socio-technical transitions, with some notable examples including the shift from carriages to automobiles in the United States (Geels, 2005a) and the introduction of pipe-based water supply in the Netherlands (Geels, 2005b).

pressure' created at two distinct levels: (1) niches, which function as laboratories for innovative rules and practices; and (2) the socio-technical landscape, characterized as a set of exogenous developments related to consumer demand, social values, and demographic trends (Geels and Schot, 2007). While the specific understanding and conceptual presentation of transitions in terms of levels is not utilized uniformly throughout the literature (Geels, 2011; Kemp, 1994), a more relevant aspect for the discussion of this chapter is that the integration of these additional levels, and the socio-technical landscape in particular, is useful to illuminate "the technical and material backdrop that sustains society" (Geels, 2011: 28). In this regard, exogenous developments in this landscape, by shifting the challenges which confront society, serve to explain how the broad expectations placed on a regime might evolve over time, and thereby shift the perceptions and motivations of the individuals operating within them. If we are to understand the selection environment for regime rules, it is therefore necessary to more closely examine the problems and challenges which are present.

### 3.2.2 The sustainability transitions framework and its criticisms

Regime-founded frameworks like those mentioned in the previous sub-section have proven useful for explaining the stability that prevails at the core of social and technical change. Since such frameworks are predominantly utilized to examine regime transformations which have already occurred, however, the task of managing forward-looking transitions to attain a specific outcome represents a new kind of challenge. Nonetheless, as the need to improve the sustainability of economic systems (and their constituent sectors) is increasingly evident in our time, it is necessary to explicate the obstacles for pursuing such transitions. With this exact purpose in mind, the attempt was therefore made to apply socio-technical transitions and its systems-level insights to develop the related approach of sustainability transitions. Broadly speaking, it is argued that, by drawing attention to the rules and practices that underlie the economic sectors with the greatest environmental impact (e.g. food, transport, energy), insights can be fostered about how to stabilize and lock-in more sustainable modes of production and consumption in the case of the food sector (see Geels, 2011). On a related note, additional emphasis is ascribed to the role of the societal context in order to understand why challenges like attaining greater sustainability are increasingly dominant and the types of systemic changes required of individuals and regimes as a result. In sum, the relevance of sustainability transitions for exploring

transformation in a sector such as the food industry is demonstrated by the combined attention to the systems-level changes required for such transitions on the one hand, and to the novel challenges which have emerged on the other.

Nonetheless, owing to its roots in the socio-technical transitions framework, some inherited shortcomings limit the ability of sustainability transitions to establish the conditions necessary for transformation in the food industry. Since the criticisms levied against this approach can provide guidance regarding the obstacles for managing transitions toward sustainability, it is informative to consider the concerns that exist in greater detail. Generally speaking, the socio-technical systems approach – and by association sustainability transitions as well – has been criticized for being overly focused on developments taking place at the level of the regime. As a result, a number of attempts are made in the literature to establish the relevance of niches within transitions (Smith, 2007; Smith and Raven, 2012). In specific, it is emphasized that attention to this level makes it possible to explain the mechanisms by which alternative rules and practices emerge and are strengthened, and also thereby manifesting the tensions that are often overlooked as a result of the focus on the stability and unity of regimes. Similarly, the conceptualization of the socio-technical landscape is seen to reflect a residual catch-all category which is insufficiently specified and lacking in dynamics (Berkhout et al., 2004). Rather than articulating the relation between regimes and the social context in richer detail, the sustainability transitions approach still finds it difficult to establish how exactly societal structure matters for transformations. In response, Voß et al. (2009: 283) have stressed how (socio-technical) landscapes generally “consist of broader societal patterns and developments that provide structural gradients of possibility for socio-technical change.” The trajectories and pathways along which an economy evolves – whether in pursuit of sustainability or some other goal – are therefore said to be organized around the salient challenges. In this manner, it is indicated how the evolution of the societal context establishes the frame in which regimes themselves evolve.

However, while expressing its connection to regime evolution, the manner in which the social context influences the emergence of regimes remains difficult to pin down – ultimately resulting in an insufficient account of regime transformation. Consequently, we come to the second point of criticism of sustainability transitions: the general and often vague description of the rules and practices at the core of regimes. Notably, there is a tendency in much of the literature to rely on explanations using rules and practices while leaving the importance of the actors within regimes unexplored. Furthermore, since regime



rules are typically conceived in rather flexible fashion as cognitive routines, shared expectations, institutional arrangements, and consumer practices (e.g. Geels, 2004), it proves generally difficult to precisely explain how regimes are established, and more specifically why some rules come to be seen as essential while others do not. In this regard, whereas this more general approach to regime rules is broadly amenable for investigations of transformations which have already taken place, the same cannot be said for the sustainability transitions we strive to achieve, given their more uncertain and forward-looking character.

Reflecting the seeds of discord within the transitions literature, alternate approaches have therefore opted for an actor-framed perspective to more clearly demonstrate the tensions, inconsistencies, and heterogeneous motivations which underlie regimes and the everyday practices of individuals. As a common feature of such frameworks, the greater importance of individual actors is expressed using a ‘flat’ conceptualization of transitions which eschews descriptions in terms of levels. For instance, practices theory (e.g. Shove and Walker, 2010) places emphasis on the idiosyncratic manner in which individuals make use of technology, meaning, and skills to inform their practices. Beyond echoing how the meanings of practices and technologies might vary by context (see Section 3.2.1), this approach also demonstrates the difficulty of predicting how individuals will respond to policy initiatives, rendering the tendency for sustainability transitions to abstract from the role of individuals problematic. Accordingly, in contrast to the stress on producers and suppliers which is characteristic of the literature (Verbong et al., 2008), it should be underscored that a deeper consideration of consumers, specifically how they adapt their behavior to changing circumstances, can set a more solid foundation for sustainability transitions (Baum and Gross, 2015; Lachman, 2013).

Apart from offering limited insight into how regimes are established, the insufficient attention to individuals within the sustainability transitions literature is especially problematic given the potential for disagreement regarding how such sustainability transitions ought to be pursued. On the one hand, there are the ever-present disagreements of a more practical nature, relating to the most effective strategies for attaining a specific aim. For example, the goal of improving the energy efficiency of households might generate suggestions ranging from lowering the room temperature to installing solar panels, each of which must then be evaluated by referring to some established criteria. Nonetheless, although such disputes certainly complicate discussions of transformation, the fact that there is broad consensus about what is to be done makes this type of disagreement less

problematic than cases where there are differences of opinion regarding how the problem itself should be defined. That is, even if it is for instance widely agreed that sustainability must be improved, the more general nature of this undertaking causes individuals to drastically differ on the dimensions which they see to be most urgent (Garud et al., 2010; Raven, 2006).

Considering how exactly this type of disagreement can be overcome is necessary if one wishes to explain how regimes are initially established. Toward this end, the difficulties which present themselves when attempting to institute a consensus on regime transformation must be spelled out more evidently. Speaking to the broad relevance of the political and regulatory spheres in this regard, the arenas of development approach therefore conceives of transitions in terms of the conflict and contestation between different ‘actor-worlds’ (Jørgensen, 2012). Accordingly, disagreement about the extent and manner of the required change is said to originate in the concurrence of distinct (and often mutually-exclusive) visions of the world. As a result, by emphasizing how individuals might focus on, and draw conclusion from, disparate features of the environment, not only the potential for differences of opinion is highlighted, but moreover the contingent nature of the emergence of regimes itself. Notably, whether concerning why a specific technical innovation is selected, or how certain regime rules come to be seen as essential, what is represented are the outcomes of a process of contestation. And since this is a process undertaken by individual actors with their own understandings of the challenge needing to be addressed, there are no set criteria which can be used to establish a consensual foundation for regime transformation. Instead, according to the approach put forward by Jørgensen (2012), such criteria must be developed on a more case-by-case basis with the salient challenges in the societal context explicitly in mind.

In sum, the general criticisms of the sustainability transitions literature which were outlined in this sub-section are meant to draw attention to the limited consideration of both the relevance of the societal context, and the role of individual actors within regimes. Moreover, although the diverse approaches provide conceptual descriptions of regimes and their transformations, one has to remain aware that something quite fundamental is left unexplored: namely, the processes by which regimes emerge and, on a related note, come to be seen as relevant for fulfilling a given societal function. In this regard, the tendency towards vague descriptions of regime rules can be identified to be deficient in two crucial respects: (1) the uncertainty over the mechanisms through which rules become capable of providing the coordination necessary to stabilize regimes; and

(2) the inability to explain why a particular rule is capable of overcoming disagreement and establishing consensus, whereas others fail. Given the need to elucidate the connection between regimes and the societal context in a more well-defined manner, the broad implication to be drawn from the shortcomings in the literature is that a more problem-oriented approach to regime transformations is required. For this reason, the next sub-section expresses how the method of historically-informed systems analysis can be used to explore the specific case of the emergence and evolution of the regime of industrial food production.

### 3.2.3 Persistent problems and regime foundations

Once we shift from the more general interest in sustainability transitions to specific cases where transitions are required, a different set of problems manifests itself. In this regard, it can be remarked that the substantial impetus for regime transformation in the food industry is broadly connected to the rising concern over problems like food safety and sustainability. Instead of exogenous developments in the socio-technical landscape, it is therefore the emergence of novel challenges which unsettles a regime such as industrial food production, and fosters a shift in how it is perceived in society. In view of the mounting calls to reconsider what is required of food production in modern societies, the relevance of a problem-centered approach for understanding and guiding regime transformation must be considered.

Building on the criticisms of existing approaches to regime transformation described in the previous sub-section, two major advantages of a problem-centered approach can be stressed. First, in contrast to a vague conception of regime rules in relation to what orients the evolution of an already established regime, a problem-centered approach specifically explores how stability is initially attained. Instead of highlighting the organizational context or technological principles that would appear to be characteristic, greater attention is thereby shifted to why regimes (and their constituent elements) are actually selected. On the one hand, by considering the challenges which confront society at a particular societal moment, it can be established more clearly how regime rules come to be assigned significance through their capacity to help a regime fulfill a broader societal function. On the other hand, by explicating the connection between the emergence of a regime and salient problems, it becomes possible by using this approach to offer a sense of the intentions and objectives guiding the

activities of individuals, and therefore to make clear how they might disagree with regard to their understandings of how problems are to be resolved.

This brings us to the second advantage of a problem-centered approach, which again is related to a criticism of existing approaches – notably the inability to establish why some regime rules are better able to overcome existing disagreements, and thus provide the foundation for regime transformations. To reiterate, substantial disagreement remains all through the literature regarding how sustainability transitions ought to be pursued and how the challenges driving them are to be defined. On both points, the relevance of a problem-oriented approach is demonstrated by relating the obstacles for transitions to the existence of a specific type of problem. Notably, within the transitions management literature, the complexity of emergent challenges such as sustainability and climate change causes them to be assigned to the category of ‘wicked problems’ (e.g. Batie, 2008, Bouma et al., 2011). The ‘wickedness’ of such problems specifically results from the inability to provide a definitive description of the problem at hand and, what is more, the impracticality of relying on scientific evidence as the basis for answers. Hence, it is the additional uncertainty and broader scope for disagreement that accompanies this type of problem which is pinpointed as the reason why sustainability transitions are hard to achieve. In other words, since the search for potential solutions is typically disrupted by the underlying problems being so open to divergent interpretations, it is inherently difficult to establish a consensus about what is needed for transitions to take hold.

Within the literature, the challenges presented by sustainability and climate change can be highlighted as the quintessential instances of wicked problems (Bouma et al., 2011; Peterson, 2013). Owing to the nascent nature of these concerns, there is a resulting tendency to explain the emergence of wicked problems as a feature of the societal context, often in relation to their destabilizing impact on the foundations of society. Notably, according to Batie (2008), the growing concern over improving sustainability is said to emerge only now because of the uncertainty surrounding the ‘linear model of normal science’ and its enduring ability to serve the needs of society, or moreover because of the broader doubt that scientific progress necessarily results in societal progress. Accordingly, given that the existing criteria for tackling salient problems are no longer seen as sufficiently objective, the situation proves wholly problematic because of the limited foundation for coordination between actors. That is, without the knowledge structures in place to reconcile the disparate viewpoints of the actors involved, there is little basis to address growing divergence between the

challenges currently confronting society and those for which the regime's structure and organization were initially established. Expressing the wider consequences of the emergence of novel challenges, the greater doubts about the foundations not only of the regime but society as a whole underscores that a sufficient solution cannot simply be a type of organization or set of technical principles that has been developed. Rather, in response to the arrival of a new manner of problems, particularly those of a wicked nature, it is the co-creation of knowledge and innovation with relevant stakeholders that is said to be required for a solution to muster the necessary level of legitimacy able to overcome potential disagreements and establish the basis for a new regime to emerge (Batie, 2008).

In order to explore specific cases of transformation in a more deliberate manner, it is vital to consider how the structure and organization of an industry is itself influenced by the problems needing to be addressed. That is, instead of highlighting the impact of problems on societies, it is the relationship between the existing regime and particular problems that specifically needs to be understood in order to become aware of the extent of change that is necessary to address a given problem. As a result, it is made more evident why some problems prove easier to address than others. In this regard, the notion of wicked problems is also utilized to examine the broader implications of the greater awareness of novel challenges for the perception of dominant regimes. With regards to industrial food production, it can therefore be observed that the significance assigned to scale production and extended supply chains is itself increasingly linked with a number of wicked problems. In a similar fashion, van Bueren et al. (2014) establish a connection between the difficulty of improving the sustainability of chicken production and the built-in 'organized irresponsibility' of this regime. It is thereby indicated how addressing complex problems in the food industry is forestalled by the continuing intensification of the current approach, even as the encompassed strategies are seen to be increasingly problematic. In addition to the wider societal consequences, the recognition of emergent problems also specifically undermines the confidence in industrial food production by raising doubts about its ultimate priorities – that is, if features of this regime do not serve the needs of society, and perhaps even act to its detriment, what then is its actual purpose?

Regarding how problems represent the foundations for regime transformation more generally, it has been further argued that the tension resulting from the combined pursuit of goals like increasing access to nutritious local food and improving the incomes of local farmers is a wicked problem in its own right

(Nelson and Stroink, 2014). That is, owing to the structure of the existing regime and its approach to food production, the attempt to tackle both these exemplary problems is fraught with substantial difficulty and prone to irreconcilable disagreement regarding how to proceed. On the one hand, it is thus clearly demonstrated how wicked problems can impact the perceptions of the dominant regime, especially since the diminishing responsiveness of the regime to the prevailing societal context can itself be identified as the source of further conflict. On the other hand, the importance of creating new knowledge and innovation in order to address salient problems suggests the need to develop new understandings of what is required for food production. Consequently, the reasons underlying the emergence of alternative consumption networks and local food systems have been specifically characterized in terms of their ability to resolve the tensions that are an outcome of the existing regime (Lake et al., 2015; Nelson and Stroink, 2014). By offering a distinct conception of the problems confronting food production, and a new approach for tackling them, such systems are seen as not only an alternative to the dominant regime but moreover a potential solution for the problems that are the result of its specific understanding of food production.

If one wishes to explain what is necessary for transformation in the food industry, it is not therefore sufficient to emphasize the problems themselves, since the broader implications of such problems for the dominant regime of industrial food production are what matters most. As such, the upshot of the foregoing discussion is that a problem-oriented approach is able to offer and explore new and interesting directions for discussions of transformation. However, for this potential to be more fully realized, it is necessary to consider in greater detail why some problems prove more difficult to tackle, or persist in spite of repeated attempts to address them. For this reason, the transitions management and systems innovation literature has introduced the concept of 'persistent problems' to explain how existing regimes are partly to blame for problems being tough to address (e.g. Bos and Grin, 2008; Grin et al., 2010; Loorbach, 2007). In line with the emphasis in this literature on governing transitions which are currently in progress, some problems are seen to represent deficits of the systems in place, indicating that they can only be solved by pursuing fundamental change in the broader system. Accordingly, although the often unclear definitions of the problems themselves are at the root of much of the dispute, it must be underlined that persistent problems introduce an additional source of disagreement beyond those which have been identified in the case of wicked problems: the disagreement over how much the regime bears the responsibility for the salient problems.

In view of the conflict and contestation that broadly characterizes sustainability transitions, the concept of persistent problems provides a basis on which to establish discussions of how much transformation is required. Generally speaking, persistent problems have four principal features, some of which are rather similar to those of wicked problems (see Table 3.1). Nevertheless, while both approaches emphasize how challenges such as sustainability can be characterized by the absence of easy solutions and the likelihood for distinct interpretations to be put forward, persistent problems differ in two crucial aspects. For one, there is a greater inflection on the role of actors in this approach, as evidenced by its heavy reliance on the framework of structuration theory (Giddens, 1984; Stones, 2005). As a result, instead of problems being seen as wicked because the knowledge structures to resolve them are no longer in place (e.g. Batie, 2008), persistent problems are more immediately expressed in the rules, practices, and decisions of the agents operating within a given system. For instance, even when individuals “try to take on enduring problems” of a regime, the tendency to rely on existing rules and resources to do so establishes actors as the (unintentional) reasons that problems persist (Schuitmaker, 2012: 1024).

**Table 3.1: The four features of persistent problems**

| A persistent problem can be characterized as being ...   |
|--|
| (1) complex with multiple causes and consequences, and rooted in societal structures and institutions;               |
| (2) uncertain with no easy solution, and with more knowledge not necessarily offering greater certainty;             |
| (3) difficult to manage with many different actors involved, each with their own interests and views; and            |
| (4) difficult to grasp because of unclear boundaries where the problem begins and ends, or where its structure lies. |

*Source:* Rotmans (2005) and Dirven et al. (2002), cited by Schuitmaker (2012).

As a result, the fact that individual actors persist in their established patterns of behavior even when the regime is seen to be increasingly problematic might be subject to question. Namely, is such behavior a matter of habit, i.e. do individuals find it difficult or are unwilling to entertain new options, or could it be that there are other gains from continuing along this path, like the promise of profits or personal benefit? By way of an answer, it must be further highlighted that

problems persist owing to how entwined they are with the structure of the regime. Therefore, the second feature that makes this type of problems unique is its essential interrelation with the structure of the regime, making it hard to identify where the problem ends and the structure of the regime begins (Dirven et al., 2002, and Rotmans, 2005, cited by Schuitmaker, 2013). As a result, the explanation for why problems persist is comprised of two aspects. On the one hand, there is the problem itself, enduring and difficult to resolve. On the other, there is the evolved structure of an industry through which this problem is reinforced. In sum, it is this essential relationship between problem and structure that is at the root of the problems proving difficult to resolve, and not the problem alone.

However, although the notion of persistent problems proves useful for elucidating why some problems are more challenging than others, it remains insufficient as currently constituted to explain why problems and structure are so knotted together. Highlighting the shortcomings in the literature, Schuitmaker (2012) has therefore pointed out that, without illustrating how the structure comes to be established, there is no way to identify the persistent problems that exist, nor even to explain why certain problems endure. For this reason, the concept of persistent problems is ‘operationalized’ by describing them as “a systematically reproduced negative side effect of a success factor of that system” (Schuitmaker, 2012: 1030). As a result, problems are said to persist on account of the enduring orientation in a given regime toward a set of success factors which, while once associated with the progress of society, now instead result in a number of adverse consequences. Rather than problems being founded around the sole pursuit of profits or the limited consideration of the challenges that exist, it is more a matter of the challenges confronting society shifting and evolving while the regime and its evolved structure have not been able to keep pace. Differently stated, it is the previous success of a regime in addressing past challenges – and the consequent emergence of novel ones to take their place – which provides an endogenous explanation of how the relationship between regime and the societal context evolves over time, and what is more establishes the mechanism by which the societal function of an industry might change.

Given the differing perspectives of the ongoing transformation in the American food industry, an approach founded on the notion of persistent problems can offer insight regarding whether the current regime of industrial food production is able to facilitate or forestall transformation. In this regard, this approach makes it possible to answer two questions. First, why are some problems increasingly



prevalent in the food industry, and why is this occurring just now? Second, how is the regime of industrial food production potentially responsible for the fact that problems in the food industry have emerged and, what is more persist over time? For this reason, the next section undertakes a historically-informed systems analysis of industrial food production in the United States to explore the historical context in which this regime emerged (see Schuitmaker, 2012). In specific, this analysis seeks to identify the success factors that were fundamental for the emergence and evolution of the dominant regime in order to establish the deeper structure of persistent problems in the food industry. Not only can it then be explained why challenges such as food safety and sustainability have proven so difficult to resolve, but moreover this historically-informed approach to industrial food production can then be used to establish the necessary conditions for transformation in the American food industry to take place.

### 3.3 Historically-informed systems analysis of industrial food production

The existence of persistent problems in the American food industry is a consequence first and foremost of the historical context in which the dominant regime of industrial food production emerged. Examining the details of its origin can therefore offer tremendous insights into why this regime and its constituent features have become invested with significance. In specific, the essential relationship between industrial food production and the societal context must be established by considering the salient challenges in the United States at the turn of the 20<sup>th</sup> century. In this light, it can be seen that what is necessary for a regime to be established as a solution for such issues is not the technological factors alone, but rather how they fit with the challenges that confronted the societal context, and moreover how individual actors worked to make them fit. Linking this way of thinking about the emergence of industrial food production with the current importance of transformation in the food industry, this latter point is especially critical in view of the substantial emphasis that is placed on establishing consensus throughout the sustainability transitions literature. That is, it cannot be expected that the particular advantages of an emergent set of technologies are either immediately recognizable by all important stakeholders, or that their relevance for the existing challenges is readily apparent. Instead, much of the work for the actors pursuing transformation is to establish the relationship

between technical principles and salient problems more firmly, reflecting both a viable direction for activities in the economic sector and an important guideline in the minds of individuals in society.

Specific to the task of tackling persistent problems in the system of industrial food production, it is further noted that the existence of multiple causes and consequences resulting in such issues indicates that there is not likely to be a straightforward answer for why problems persist in this regime. Hence, Schuitmaker (2012: 1030) remarks that, if one wishes to identify the persistent problems in a given system, the relevant answer must take the form of “a short story revealing important systemic factors involved in the (re)production of enduring problems.” That is, given the connection between persistent problems and the structure of the dominant regime, the potential to pinpoint problems in the food industry – as well as understand how they might possibly be addressed – demands the consideration of the historical context in which industrial food production emerged. Notably, by drawing attention to the fact that aspects now seen to be problematic were not always so, it becomes more possible to distinguish persistent problems from the evolved structure in which they have become so entangled. For this reason, historically-informed systems analysis is utilized in the following sub-sections to develop an account of the emergence and evolution of the regime of industrial food production. To orient this analysis, it is first necessary to identify the success factors that were prominent. And, as a result, this ‘short story’ begins with a concentrated emphasis on the factors of scale, scientific expertise, and standardization to establish their relevance for this regime before Section 3.3.2 offers a description of how they came to be seen as ‘successful’.

### 3.3.1 Identifying the success factors of the regime of industrial food production

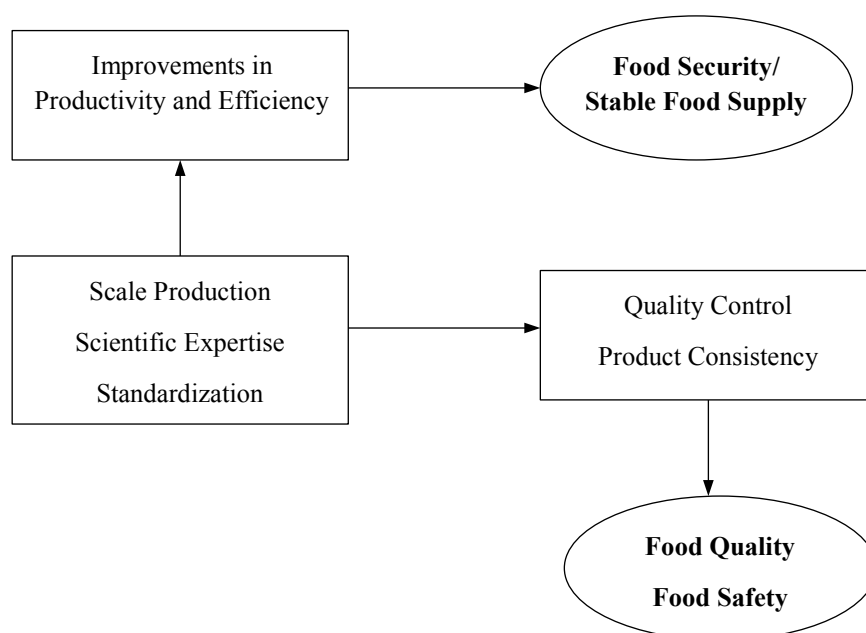
By way of orienting the historically-informed analysis of industrial food production, this sub-section sets out to highlight the general features of this regime before then establishing how they proved significant for its evolution. For this reason, it is necessary to briefly outline the societal context in which this regime emerged. At the turn of the 20<sup>th</sup> century, which can be marked as the beginnings of a more industrial form of agriculture and food production, the United States could be characterized as considerably rural, both economically and

socially. Even though the results of industrialization were slowly taking shape, not only was it the case that more individuals were living in rural environments than cities, but a substantial share of employment (39%) and gross domestic product (>30%) was tied up in agricultural production (Council of Economic Advisors, 2006). Still, the widespread concern over the insecure and inconsistent access to decently nutritious food was sufficient to establish the task of fostering an organized food industry as a high priority. Hence, the objective of producing the greatest quantity at the lowest price possible – as well as the related importance of improvements in productivity and efficiency – represented an essential prerequisite for the development of a more stable food supply. The significance of the factors of scale production, standardization, and scientific expertise must therefore be explored in relation to this fundamental pursuit. Daring a glimpse into the future, consequent to the gains in productivity and efficiency which were realized by the development of an industrial regime of food production, it is possible at present for approximately 322,000 principal farm operators (or 0.001% of the population) to be able to produce 90% of the food consumed in the United States (Conkin, 2008: 164). All in all, if the United States can claim to be an urban, wealthy, and industrialized nation, this status is owed in large part to the ability of mass production to make this transition possible.

The regime of industrial food production can be characterized by the existence of a number of general features. In specific, there are the methods that associated with this system, e.g. the introduction of large-scale machinery; the electrification of food production and processing; and the increased reliance on chemical inputs such as fertilizers and pesticides. In this regard, the vast majority of the historical accounts of the evolution of food production can be seen to describe in wonderful detail how the advent of new machinery helped foster the shift towards larger-scale operations. A notable example in this respect, Conkin (2008: 99-107) highlights ‘the great new machines’ as one of the four crucial dimensions for the agricultural revolution which took place in the United States in the decades following World War II – with the other three requirements being ‘electrification’, ‘chemical inputs’ (i.e. fertilizers, insecticides and fungicides, herbicides, antibiotics and steroids), and finally ‘plant and animal breeding’. Furthermore, mass production is widely recognized for the substantial gains in productivity and efficiency made possible through the greater application of large-scale industrial methods. In fact, the surge in technical investment over the latter half of the 20<sup>th</sup> century was prominent enough to promote increases in output per individual farm-worker of 68 percent in the 1950s and 82 percent in the 1960s (Conkin, 2008: 97–99; Gardner, 2002: 15–18). What is more, the extent of this growth has been

sustained in a manner that is mostly unparalleled. Since 1950, labor productivity has increased 7-fold in the agricultural sector versus only 2.5-fold in the non-farm sector, with total productivity growth similarly exceeding that of all but two of the largest manufacturing industries over this same period (Clarke, 1994; Gardner, 2002: 28–45).

As a result, the major factors which have guided the evolution of the regime of industrial food production can be described in generally technical terms, notably given how improvements in productivity and efficiency were essential for attaining an adequate supply of food. However, since the initial establishment of this regime also featured developments such as increasing the scale of the supply chain, expanding the scientific expertise of food-related activities, and a greater standardization of food production and processing, it is necessary to consider how these factors were more broadly relevant for communicating product quality and food safety. In this regard, Figure 3.1 serves as a template of the discussion which is to follow.



**Figure 3.1: Principles and objectives of large-scale industrial food production**

### 3.3.2 Describing the context of the emergence of industrial food production

For the first part of the historically-informed systems analysis, it is established how the salient challenges which confronted the United States at the turn of the 20<sup>th</sup> century set the stage for the emergence of industrial food production. In this vein, some of the problems constraining the transition towards a more urbanized and developed society were briefly described in the previous sub-section. Concerning the task of food production, the broad trends of immigration and population growth were attended by an increasing stress on the existing food supply. For this reason, fostering improved food security and alleviating the pressure on the food supply featured prominently among the concerns of that era. In fact, given the wider consequences in the form of the inability of workers to effectively perform their physically-demanding jobs as well as political unrest in increasingly populous cities, the aim of attaining an adequate and sufficiently nourishing food supply was a crucial prerequisite for economic growth.

Given the extensive growth in population toward the end of the 19<sup>th</sup> century, the potential to develop a food ‘industry’ that could effectively feed a growing urban workforce might seem at first glance a simple task of improving productivity and efficiency. However, setting aside the fact that the use of large-scale industrial techniques for food production was essentially unfamiliar in this time, it must be stressed that the greater separation of the rural environments where agricultural production largely took place from the cities in which individuals worked and resided presented a number of other issues to be resolved. Notably, bound up with the sweeping transition from a markedly rural economy to one dominated by urban contexts and large-scale manufacturing, the shifting relationship between society and its food supply in this period gave rise to problems of a more logistical nature. In part, in order for the budding food industry to take hold, an extensive infrastructure needed to be in place to transport the food the necessary distance from field to fork – reflecting the fundamental part to be played by innovations of a technical nature such as railroads and refrigeration.

However, the significance of such developments can only be partly revealed so long as the impactful role of quality communication in a context dominated by a shifting relationship between food producers and consumers remains unexplored. Notably, the evolving societal conditions brought with them fundamental limitations on the ability of individuals to gather information about food quality. By creating greater opportunity for deceitful and fraudulent activity on the part of

producers, threats related to food safety and food poisoning became increasingly prevalent towards the start of the 20<sup>th</sup> century, resulting in wider concern about public health.<sup>6</sup> In this regard, it must be underscored from the outset that problems related to food safety proved difficult to address by pursuing improvements in technical expertise alone. Notably, although improvements in productivity and efficiency were required to keep pace with urbanization and immigration, it was not only the increasing stress on existing sources of food production which became problematic. Within the burgeoning urban environments, it proved moreover increasingly difficult to obtain safe and nutritious food due to the upheaval in established channels of food distribution. Prior to the beginning of the modern era of food retailing with the advent of chain stores in the 1920s (Ellickson, 2015; Tedlow, 1990), the primary outlets for procuring food in flourishing cities were the unlicensed street vendors that mushroomed to fill the vacuum of food retailing. As a result, the lack of ‘brick-and-mortar’ establishments can be said to have exacerbated the challenge of quality verification, not to mention having provided the perverse incentive to not invest in quality production. Notably, owing to the ease with which producers could change location, it was substantially difficult to track and monitor a particular producer if any problems did occur. Following an unfortunate instance of food poisoning, a vendor could for instance easily pack up shop, move to a new location, and start up again where consumers were none the wiser.

Consequently, the institutional environment can be counted among the prominent causes of food insecurity in early-20<sup>th</sup> century America, especially given the incentives for producers to make fraudulent claims and purposefully degrade quality. In this regard, the practice of food adulteration, where cheap and potentially dangerous ingredients were substituted for more expensive ones, represented one of the most widespread strategies for producers to reduce costs as much as possible, and thereby maximize short-term profits. What is more, owing to the general suspicion of food safety that resulted from the lack of an established regime of food production, this ‘fly-by-night’ strategy often turned out to be the most profitable way to get by in the difficult climate which confronted food producers – even if not the most ethical. In this respect, the fitness of this strategy is demonstrated by the fact that the development of schemes and methods to adulterate food, rather than utilized by only a few producers, were so common and strikingly elaborate as to have resembled an art form. In the case of processed

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<sup>6</sup> For a detailed account of the pervasive anxiety over food safety in urban contexts in this societal moment, one need look no further than Upton Sinclair’s (1906) muck-raking journalism in “The Jungle” and its revelations about the American meatpacking industry.

products like ketchup, the ‘art’ of food adulteration took the varied form of using fermented tomato waste in place of fresh tomatoes, as well as mixing in lower-cost ingredients such as pumpkin and squash pulp. More lethally, toxic substances like arsenic, boric and salicylic acids, aniline dye, and mercury found a use in ketchup production, partly for their cheapness but also owing to their ability to limit food decomposition and disguise unsanitary production conditions (Collins, 1993; Harvey et al., 2002). However, although these kinds of strategies proved profitable in the short term for the firms involved, its prevalence gave rise to a set of conditions that were not conducive for investment in quality production. Notably, given how food adulteration made it effectively impossible to determine whether or not a product was safe, a ‘market for lemons’-type situation could emerge where consumers were unwilling to pay more for allegedly higher-quality food and producers therefore unable to attain the higher prices that made the risks of quality innovation worthwhile (Akerlof, 1970).<sup>7</sup> As a result, citing Gresham’s Law, it can be predicted that bad quality eventually drives good quality from the market, unless a viable basis for quality innovation is established. Moreover, the lack of incentives to pursue improvements in product quality created sources of food adulteration which that broadly technical in nature as well. Compounding the institutional bases of insufficient quality, it can be underscored that reasons for adulteration “could range from contaminants or additional ingredients finding their way accidentally into food, to systematic and deliberate substitution of ingredients and addition of dyes or chemicals to disguise the results” (Harvey et al., 2002: 166). Beyond tackling the incentives for free-riding behavior, the potential to improve food quality further required the consideration of more explicitly technical issues such as inadequate control of the production process and the limited consistency of food products as well.

In sum, the problems confronting food production in the United States at the beginning of the 20<sup>th</sup> century cannot be explained in either institutional or technical terms alone, given that it was the interaction of the two as expressed by the relationship between societal context and production regime which made it difficult to develop a safer and more secure food supply. The next half of the historically-informed systems analysis will therefore engage with the key factors and technical objectives described in Section 3.3.1 to explore how these were established as success factors relevant for tackling the salient challenges and

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<sup>7</sup> Supporting the use of the literature exploring information asymmetry and the ‘market for lemons’, it is notable that the ephemeral nature of producer-consumer interactions in this context makes its application of a one-shot anonymous encounter substantially more relevant than is typically the case in the food industry.

problems in this context. The following analysis is therefore motivated to answer one question in particular: How were the aforementioned success factors relevant for the challenges confronting American society at the turn of the 20<sup>th</sup> century, and what is more how was this relevance instituted?

### 3.3.3 Establishing congruence between the principles of industrial food production and the salient societal challenges in early 20<sup>th</sup>-century America

Having illuminated the broad contextual features of American society at the start of the 20<sup>th</sup> century, it is now time to more closely examine how the regime of industrial food production came to represent the solution for the salient problems and objectives at that specific societal moment. Given how quickly a discussion of this scope can become untenable, the second part of the historically-informed systems analysis is made more tractable by concentrating on how actors in this regime went about establishing conditions more conducive for investments into improving food quality. Notably, given its overlapping institutional and technical foundations, the problem of food adulteration, to continue the earlier discussion, could not be resolved by the isolated activities of individual firms, but rather required efforts from a number of actors in a variety of different sectors to cultivate an environment in which higher-quality production could take hold. For this reason, instead of focusing on either the technologies or institutions that characterized industrial food production in this analysis, it is more important to explain how coordination was established in this regime around a nascent definition of food quality and safety. Rather than evaluating the technical emphasis of industrial food production toward pursuing gains in productivity and efficiency for their own sakes, it is therefore necessary to consider how features of this regime like scale, scientific expertise, and standardization could be established as relevant for the threats that were salient in the broader social environment.

Beginning with scale production, the difficulty of monitoring producers that could easily change location rendered the perceived association between small-scale production and food adulteration rather easy to imagine. The ability to rely on large-scale production to distinguish products and firms from one another therefore emerged quite naturally in this context. It is particularly noteworthy in this regard, that the advent of branding occurred around this time in order to make



it possible for consumers to keep track of companies (Collins, 1993). So, even as the distance between field and fork became increasingly large, the presence of brand reputations could be utilized as the basis for developing quality expectations. Nonetheless, to address the broad concern that producers might engage in food adulteration, it was not the brand alone that proved relevant, but rather what the brand implied about the commitment of the firm to quality production. In this vein, Andersen (1994: 12) suggests that, from the view of consumers, the familiarity of a national brand demonstrated that a producer was willing to “make investments to secure and develop their brand”. In other words, the fact that a brand is prominent is said to indicate a firm that has more to lose from any instances of quality breakdown, no matter whether accidental or deliberate (e.g. Allen, 1984; Shapiro, 1983). By signaling the long-term commitment to quality production and stability of the producers involved, the high initial costs of capital investment were therefore effective as a guarantee of food quality in a climate where larger producers were rare.

Meanwhile, from the perspective of firms, the link between brand reputations and scale enabled firms to establish ‘ownership’ of their investments in quality production. Since it was difficult for smaller producers to imitate this feature during this period, it became common for large-scale producers and retailers to utilize “heavy and extensive investments in products and properties, in goodwill and reputation and in marketing methods and retail organization” to initially protect themselves from competition (Jeffreys, 1954: 97). In sum, the existence of sunk costs into production, no matter the type, represented a valuable asset for firms wishing to distinguish themselves from an association with low-quality production. And, as a result, the growing emphasis on scale production not only provided the basis for undertaking quality innovation, but also established a barrier to market entry allowing larger firms to experiment with potential methods to improve the level of food quality. Nevertheless, for industrial food production to be founded as the solution for the threats facing health and food safety, it was insufficient for firms within the budding food industry to not be lumped together with low-quality production. Instead, the potential for a sustained basis for quality innovation called for actors in this production system to also put forward and support their own claims for why this approach represented a legitimate means of producing high-quality food. Beyond investments in the production process, the relevance of features such scale production extended to their capacity to provide a credible foundation for quality production, notably by promoting a clear relation between the regime of industrial food production and existing expectations of quality production – which often entailed the negotiation of the extant definition

of food quality itself. In this regard, establishing scale production as a credible signal required that this feature of the technical system be linked with understandings of quality production in a manner that was exclusive and difficult to imitate, and what is more shown to be safe for consumers.

Without losing sight of the fundamental problems of food adulteration and consumer fraud, it is crucial to highlight how more proximate considerations of food quality such as inadequate control of the production process and limited product consistency were also relevant in the early stages of the 20<sup>th</sup> century. For this reason, the development of expert-driven systems was often proposed as one potential solution to improve the health and safety of food production. In particular, given the aim of fostering greater control and consistency throughout the supply chain, technical considerations like scientific expertise and standardization were increasingly employed to communicate a specific vision of quality in food production. The challenge of establishing the safety and overall quality of food in a convincing way was especially critical given that, even as scale production came to represent the means to distinguish producers, the perceived credibility of this emergent approach was not assured in the eyes of consumers. In this regard, while it is understandable how concerns over the safety of large-scale industrial methods might seem strange in view of their current dominance, it must be underscored that the reliance on an assembly-line organization was far from commonplace for American food production in the period under consideration. In fact, to contend otherwise would diminish the substantial efforts which were required to establish a regime of food production around an emphasis on standardization and scientific expertise. Speaking broadly to their relevance for health and food safety, fostering the emergence of large-scale industrial methods proved especially challenging and controversial in the domain of food production given “the intimate connection of food markets to body and health [and] the existence of varying concepts and perceptions of related risks” (Spiekermann, 2011: 11). On the former point, the potential risks that the regime of industrial food production entailed for individual and public health can be more prominently displayed in relation to the consequences of incorporating – in the strongest sense of the word (Fischler, 1988) – food that was perceived to be unnatural and/or potentially harmful. When seen alongside the severe concern that attended the emergence of this regime, it is therefore not surprising that initial attempts to utilize innovative scientific knowledge for food production was greeted with substantial suspicion, and that “a remarkable percentage of these product innovations and product changes were initially perceived as adulteration [which] caused heightened uncertainty at the food market” (Zachmann, 2014:

11).<sup>8</sup> In order to emphasize this point more fully, it is thus reiterated that: The large-scale industrial methods of food production, now so common and taken for granted, were once perceived to represent an instance of food adulteration rather than its solution.

Among the most prominent expressions of the use of expert-driven systems to establish the ‘artificiality’ of food, H. W. Wiley and the newly-founded Bureau of Chemistry conducted a set of highly-publicized ‘hygienic table trials’ in the first decade of the century to demonstrate the impact of various preservative and additives on human health.<sup>9</sup> In these trials, ‘doses’ of preservatives and additives which were commonly in use like borax, benzoate, formaldehyde, sulfites, and salicylates were administered to participants in their food. The ‘poison squad’ studies, as they came to be called, represented one of the first attempts in the United States to establish a basis for food regulation through scientific standards (Lewis, 2002). What is more, accompanied by the slogan of ‘None but the brave can eat the fare’, the results of these trials succeeded in focusing the public attention on the difficulties of attaining consistency and control in food production, as well as the potential role for expert-driven systems. With the ambition of eliminating food that was ‘contaminated’ by unwanted and suspect variability, the notion of a ‘purer’ food supply consequently came to represent the core pursuit orienting the activities of the diverse sectors relevant for food production. Describing how scientific ideals were seen as a guiding light in this context, Spiekermann (2011: 11) for instance remarks that the “chemical redefinition of food was possible because it seemed to be the most promising way to fight fraud and deception in the food markets.” In particular, he further notes how the objectivity and standards of science played a crucial role in attaining the goal of ‘pure food’ by giving rise to “the idea that chemical science could define ‘purity’ consensually” (p. 21). In spite of the initial unfamiliarity of such methods as well as the differing opinions on the level of risk that was appropriate for food production, a broad public movement for pure food thus emerged around this notion of an incontestable definition of quality. This public movement for pure food – “driven by journalists, academics, and bourgeois women who demanded state intervention for the public benefit” (Spiekermann, 2011: 20) – paved the way

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<sup>8</sup> Describing the significant upheaval brought about in the existing knowledge structures of food production, Zachmann (2014: 11) thus underscores how this new system “challenged the experience-based knowledge not just of consumers but also of food merchants to make judgments on food quality.”

<sup>9</sup> This federal agency, founded in 1901, was the predecessor to the modern Food and Drug Administration, with its main contribution being the introduction of laboratory methods to study food adulteration and misbranding.

for established ‘standards of purity’ with the passage of the Pure Food and Drug Act of 1906.<sup>10</sup>

Reflecting the wider significance of this public movement, the growth in urban environments can be noted to have also given rise during this period to the desire for purity in the additional forms of, for example, the growing demand for sanitation and waste services and aggravated concern over the impact of zoonotic diseases (Atkins, 2008; Hardy, 2002). As a result, besides the threats of food adulteration and consumer fraud, the parallel emergence of these other underlying problems associated with disease and uncleanness reflects the general priority assigned to ‘purifying’ urban environments. The claims of industrial food production to being trustworthy were therefore established not in contrast to the perceived shortcomings of small-scale production alone. More generally, in order to further indicate its commitment to quality production, this system framed its continued pursuit of scientific expertise and standardization as an attempt to control and impose order on the suspect and unwanted variability of natural processes. Instead of the more narrow aim of monitoring small-scale producers to avoid food adulteration, one of the chief selling points for industrial food production – and its measurable standards and advanced technologies – was linked to “the appeal of objectivity” and its relevance for attaining “the mechanization of natural reproduction, growth, and decay” (Zachmann and Østby, 2011: 2, 6). According to this view, issues such as food adulteration, intentional or otherwise, and product inconsistency were not problems to be limited but rather risks to be completely eliminated so as to realize the vision of purer, more objective society. For instance, by establishing an association with the of uniformity and control, the desire to establish a more ‘hygienic’ form of tomato production fostered innovations such as: the mechanization of canning, invention of pressure cooking, equipment for cleaning and cutting, as well as the cultivation and design of a hybridized tomato suitable for commercial production (Harvey et al., 2002: 160–164).

Given the greater relevance of the technical aspects of food production in early 20<sup>th</sup>-century America, the slow transition from a production system resembling a ‘scaled-up kitchen’ to a ‘science in command’ regime helped advance the general interests of society beyond just food (see Harvey et al., 2002: 160–168). In this regard, owing to their crucial role in establishing a relationship between industrial

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<sup>10</sup> However, due to the failure for the expert-driven system to actually engage with the concerns and competencies of actual citizens, among other reasons, Spiekermann (2011) observes that the introduction of legally binding food standards ultimately had to wait until the Food, Drug, and Cosmetic Act of 1938 and the creation of the Food and Drug Administration.

food production and the salient challenges in this context, specific features like scale production, scientific expertise, and standardization not only signified the criteria used to select technologies but moreover the rallying principles making it possible to coordinate activities throughout the regime as a whole. The broader relevance of these success factors can be made more apparent by noting how, even without the existence of regulatory standards, their success in communicating the relation between this evolving production system and specific understandings of food quality allowed large-scale producers like Heinz to establish the ‘moral high ground’ which forced their competitors to abandon the use of preservatives.<sup>11</sup> Consequently, the relevance of overcoming variability and instability was seen to be so crucial for the further development of food production in the United States that it is assigned the status of “a precondition for the creation of a mass market for food products” (Harvey et al., 2002: 165). Instead of the dimensions of agricultural revolution being broadly dominated by technical and organizational innovations (cf. Conkin, 2008), it was the ability for scale production, standardization, and scientific expertise to communicate product quality and safety – an essential step for cultivating trust in and credibility of the regime of industrial food production – which established them as success factors and set the stage for further innovation and the continued evolution of the regime along these lines.

### 3.4 Persistent problems and the structure of industrial food production

The historically-informed systems analysis of industrial food production established in greater detail why features like scale production, standardization, and scientific expertise have come to be fundamentally associated with quality production in the United States. Notably, since the problematic nature of food production at the turn of the 20<sup>th</sup> century could be resolved through developments in these directions, the constituent features came to represent success factors. That is, for challenges ranging from food safety to a stable food supply, industrial food production was able to establish its relevance through the continued emphasis on

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<sup>11</sup> Encapsulated by the slogan ‘Good Ketchup needs no Drugs,’ the success of this ‘pure food’ campaign enabled this company to charge 25-30 cents a bottle compared with the 10-12 cents of rivals, illustrating the stable source of rents which was attained (Harvey et al., 2002: 167).

scientific expertise, standardization, and scale production. In specific, this relationship between these factors and the extant understandings of food quality depended on the perceived relevance of the instrumental aims of quality control and product consistency (see Figure 3.1). As such, the emergence of the regime of industrial food production – and the establishment of scientific expertise, standardization, and scale production as success factors – resulted from its ability to establish the necessary foundations for stability and consensus, that is, by enhancing quality control and product consistency.

Much has changed in the interim owing to the sweeping impact of industrial food production on the economic and social structure of the United States. In fact, it is argued that “the greatest industrial revolution in our history has occurred, with all its economic benefits and human costs, down on the farm” (Conkin, 2008: x). However, as the benefits of this regime are gradually supplanted by the costs passed onto society, there are growing doubts about the enduring suitability of industrial food production as the dominant regime. Regarding obesity, an issue frequently linked with the emphasis of this regime on producing the greatest quantity of food at the lowest possible price, the medical burden of treating this disease has doubled since 1998 to currently amount to \$147 billion – or 10% of all medical spending (Finkelstein et al., 2009).<sup>12</sup> Moreover, the annual costs of food safety-related illness in the United States – whether involving the more mundane cases of food poisoning or severe consequences such hospitalization – are estimated to add up to as much as \$1.4 trillion (Roberts, 2007). In view of the substantial costs of persisting with the current approach to food production, which does not even consider the more difficult-to-calculate costs of climate change, questions about the further hegemony of industrial food production have become increasingly prevalent. In particular, marked by the shifting understanding of what constitutes quality production, it can be asked how the relationship between the dominant regime and the broader societal context is potentially affected. And moreover, given the desire to reduce the costs that must be absorbed by society, this line of discussion makes it necessary to ask what can be said about the extent to which industrial food production is itself responsible for the enduring problems in the food industry.

In order to answer these questions while also laying the groundwork for the discussion of the (pre)conditions for transformation in the food industry, this

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<sup>12</sup> In fact, given the expected increase in obesity prevalence in the future, it is estimated that nearly \$550 billion could be saved over the next two decades simply by keeping obesity at current levels (Finkelstein et al., 2012).

section provides examples of how the continued reliance on the success factors of industrial food production now results in the advent of persistent problems. However, before providing specific instances of persistent problems, it is important to outline some broad reasons why the evolution of a regime along an established trajectory might become problematic over time.

### 3.4.1 The evolving relation between industrial food production and the societal context

For sectors with a prominent societal function such as the food industry, it is established in the previous section how it can never be simply about the race toward more specialization, larger farms, and fewer farmers, but rather that these pursuits pave the way for societal progress. In this regard, it must be emphasized that the emergence of productivity and efficiency as end objectives for food production at the turn of the 20<sup>th</sup> century occurred for similar reasons, and not only for the pursuit of an adequate food supply. Given their attachment to success factors like scale production and scientific expertise, the (often implicit) belief has emerged that gains in productivity and efficiency are sufficient for the further development of food production in the 21<sup>st</sup> century, no matter the specific challenge or contextual settings involved. Besides the mostly historical nature of this assessment, its accuracy can be supported by examples of how the system of mass production has demonstrated the flexibility to facilitate improvements in the increasingly demanded qualities of convenience, taste, and freshness, some of which were once seen to be antithetical.<sup>13</sup> Still, it is more broadly evident how an abridged account of industrial food production – one concentrated only on the enduring reliance on productivity and efficiency – comes at the substantial cost of being able to understand its capacity to foster quality improvements. Furthermore, without an explicit appreciation of the relationship between this regime and the evolving societal context which is characterized by an increasing range of novel objectives associated with food production, it is not possible to establish the potential for transformation in the food industry.

Many suggestions might be put forward to explain the shifting relationship between industrial food production and the societal context in the United States.

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<sup>13</sup> The discussion of Harvey et al. (2002: 194–196) is particularly interesting in this regard, though it is necessary to set aside such ‘late-stage’ developments of industrial food production in order to more deeply consider aspects related to the emergence and evolution of this regime.

To begin with, there is the diminishing salience of starvation as a threat for those consumers living in developed countries. It must be stressed that the pursuit of quantitative objectives in the food industry no longer retains its previous significance for society, but is instead supplanted by the greater interest in an expanding set of qualitative objectives taking the form of product qualities. Although current discussions of the food industry often proceed by connecting the emerging importance of specific qualities to for instance the growing media attention to ‘food issues’, the consequences of globalization, or the broader shift in the values and attitudes in society, we opt against pursuing this line of argumentation in order to avoid lapsing into a back-and-forth criticism and defense of industrial food production. Instead, applying the insights provided by Section 3.3, it is specifically considered how the changing societal expectations of quality production in the modern food industry impact the significance of historically-relevant success factors such as scale production and scientific expertise. In other words, it is asked whether, and to what extent, the large-scale, industrial system of production is limited in its ability to address the increasing range of objectives associated with food production.

Before employing the notion of persistent problems to clarify the evolving relationship between industrial food production and the broader societal context, it is critical to consider how, beyond their historical significance, the aspects of the industrial revolution which transformed the face of American agriculture and food production are still reflected in the present goals and activities of the food industry in the 21<sup>st</sup> century. At first glance, the enduring reliance on aspects such as the scale of production and the degree of scientific expertise indicates the tremendous significance which is assigned to these established success factors as strategies for resolving the perceived deficits of industrial food production in the present context. For instance, responding to the greater demand for quality assurance, it is still argued that greater trust and credibility can be fostered in the food industry by inserting “several layers of quality control and product selection into the vertical stream of deliveries between [a consumer] and the primary producer”, i.e. lengthening the supply chain (Andersen, 1994: 32). Furthermore, the tendency to emphasize the importance of improvements in productivity and efficiency remains prevalent throughout discussions of the food industry. As such, the occurrence of recent structural change to facilitate the greater integration of the supply chain in the food industry and the increasing consolidation of the retailing sector are both explained in relation to the long-term drive toward improving consistency, productivity, and efficiency (Kaufman, 1999; MacDonald and McBride, 2009). Representing yet another instance of how historically-established aspects of food



production remain relevant for the modern objectives of the food industry, the argument is put forth that the use of ‘process engineering knowledge’ to attain increased control of the relationship between the production process and product qualities can offer a general set of principles to orient quality innovation (Earle, 1997). In other words, quality innovation which focuses on the increasing application of scientific and technical knowledge to food production is required in order to foster further improvements in quality control and product consistency, i.e. by specifically engineering food structures with the stability, consistency, sensory properties, and nutritional values which is seen to be desirable.

In each of the described cases – irrespective of whether the particular aspect is scale production or scientific expertise – how the strategy for improving the quality of food production evidently entails the further extension and application of the existing template for quality innovation. In this perspective, the challenge of quality innovation, in contrast to the broader difficulties of improving food safety and sustainability, is reduced to an ‘engineering problem’ that envisions food production as an assembly process taking place across a number of stages, with each link able to employ its own expertise so as to minimize the possibility of quality breakdown. In fact, somewhat disregarding the growing consensus within the American society that transformation in the food industry is required, Conkin (2008: 173) observes the presence of a broad presumption throughout many academic and policy debates that “our overall system of farming, which developed over the last century, is beyond challenge.” In this regard, the legacy of the industrial revolution of food production is still so prominent that, even in the face of novel environmental and health-related challenges, the food industry continues to proceed along its well-trodden path.

Conversely, if it is instead argued that the enduring ‘success’ of industrial food production is contingent on factors retaining their unique relationship with the challenges confronting society, it is vital to contemplate what occurs when the aspects of quality control and product consistency are no longer as ultimately meaningful for quality production as they once were. As such, the steady emphasis on the aforementioned success factors illustrates how this regime remains broadly responsive to the issues that it initially emerged to resolve, i.e. an insufficient food supply and the inadequate control of the production process. And yet, it therefore follows that this regime is not necessarily designed to tackle the issues of sustainability and food safety which have become strikingly relevant in recent years. With this being the case, one potential explanation for the difficulty of keeping up with the societal expectations of food production would deliberately

consider, what industrial food production was designed to do, and moreover what it was not. Hence, if it is recognized that the original template of quality innovation cannot be truly relevant for the changing climate of food production, it must then be asked why the emphasis on it is so broadly maintained.

In view of the tendency to ascribe the limited incidence of quality innovation to a desire to keep the costs of production as low as possible, the reliance on instrumental factors such as scientific expertise and scale production – and as a result the broad approach of industrial food production itself – is increasingly seen as guided by motives of profit maximization and the more narrow pursuit of economic benefit. To explain the limited momentum for transformation in the food industry, it is for example sometimes argued that insufficient potential profits exist to induce producers to depart from the status quo and, for instance, engage in innovation to improve the nutritional quality of food (Earle, 1997). In accordance, the continued pursuit of improvements in productivity and efficiency is seen to represent the safest means to maximize profits, namely since producers need not abandon the tried-and-true approach to food production in favor of one that boasts no guaranteed source of additional profits. Similarly, it is presumed regarding the demand side that salient issues are not addressed partly because the majority of consumers are not willing to pay a higher price for food grown or produced in an ‘unconventional’ (and more cost-intensive) manner, e.g. through alternative networks that approach food production in a more locally-structured and environmentally-friendly fashion.

However, what this evaluation of the food industry fails to realize is that it is not the attempt to maximize profits by improving productivity and efficiency that is at the core of problems in this industry. Instead, the more fundamental issue is that the pursuit of this principle which is characteristic of a more ‘historic’ food production is less aligned with current expectations of quality production, and therefore not broadly conducive for the further development of food quality. In this regard, the analysis presented in the previous section has demonstrated how, under the right societal circumstances (in the case of this chapter, those of early 20<sup>th</sup>-century America), pursuing the technical objectives of productivity and efficiency can actually be seen as more or less synonymous with the attainment of more general aims like food security and food safety – which is why it is inaccurate to say that current problems in the food industry are the direct outcome of an over-emphasis on productivity and efficiency. Even so, the significance of industrial food production now appears, in a manner of speaking, to be defined by its interest in bottom-line considerations and not its capacity to facilitate societal

progress. By continuing to rely on the long-established success factors in this industry even when they ceased to be sufficiently specific for quality production, the outcome of the diverse activities of this regime no longer fosters improvement in, for instance, the safety and overall quality of food, but rather an array of undesirable consequences which are especially detrimental for the goal of building a more sustainable society. Somewhat paradoxically, since such problems lead to the passing-on of the hidden costs of food production onto society, the perceived necessity for transformation in the food industry is further heightened not because of any fraud or misdeed on the part of the regime, but simply from proceeding with business as usual. Thus, it can be reasoned that the emphasis on such criteria within industrial food production, and the resulting unwillingness to establish a new regime, is currently forestalling transformation in the food industry, reflecting the substantial shift in its previous function within society.

### 3.4.2 Explaining the persistent problems of industrial food production

The persistence of problems in the food industry has roots which are much deeper than either the actions of specific firms or even emerging challenges such as climate change and obesity. As such, the incidence of persistent problems is a direct outcome of the unsettled situation between the set of technical principles which have been established as success factors and the salient objectives of the societal context. At this point, it is recalled how the definition of persistent problems characterizes them as “a systematically reproduced negative side effect of a success factor of that system” (Schuitmaker, 2012: 1030). Problems therefore persist because of the lasting orientation of a regime toward a set of principles seen as sufficiently relevant to guarantee innovative activity for the regime. However, whereas the success factors of scale production, scientific expertise, and standardization with their importance for the food industry once represented the basis for societal progress as well, the fact that the understanding of what constitutes progress in a given society continues to evolve ultimately indicates that this stability and organization can actually make the regime less responsive to the broader societal context. Indeed, given that problems are becoming more pervasive, it is specifically illustrated that the principles guiding the technical production system have become unbound from the challenges which are salient.

Whilst the workings of the emergent food industry and its constituent key principles once served the broader progress of society in early 20<sup>th</sup>-century America, the story has changed as industrial food production and its particular methods have become increasingly commonplace. Generally speaking, a fundamental disconnect is now apparent between the solutions put forward by actors in the regime and the recent serious problems needing to be addressed. Perhaps the best example to make this evident can be delivered by looking into the changing perception of food-related standardization in modern societies. Speaking broadly about the difficulties that emerge as a regime continues to evolve, Andersen (1994: 12) remarks that the increasing prevalence of a given production process allows “low-quality sellers [to] mimic the credentials of high-quality sellers in a way which makes it impossible for the buyer to discern between them.” In his view, with free-riding sellers behaving as if they have invested in control systems, it becomes necessary for high-quality sellers to stress the control and consistency of their processes, and to specifically distinguish themselves by further formalizing their systems and standardizing their product designs (Andersen, 1994; Andersen and Philipsen, 1998). And yet, while this strategy is reminiscent of the relevance of standardization as a success factor in the regime of industrial food production, it is exactly the further systemization of their control systems which makes high-quality producers easier to imitate. In this regard, since this factor is no longer sufficiently specific for quality production, its continued use within the regime can end up providing a set of perverse incentives to not engage in further quality innovation.

Following this example of how persistent problems emerge, the remainder of this sub-section provides specific instances of the link between such problems and the continuing reliance on the historically-established success factors for industrial food production. For instance, reflecting the stark contrast with the notion of standardization and uniformity as offering the potential to control nature, the National Academy of Sciences concluded, in the wake of an epidemic of corn blight in 1970 which wiped out nearly a quarter of the country’s crop, that agriculture in the United States was “impressively uniform genetically and impressively vulnerable” (National Academy of Sciences, 1972: 1). The goals of product consistency and quality control now having been broadly realized, the situation presents itself where the consequential desire for ‘genetic uniformity’ in food production is linked to the incidence of pest epidemics and other undesirable consequences for society (Hogg, 2000; Raeburn, 1995: 127–145).

Additionally, owing to the importance assigned to product consistency and quality control in this regime, there is a resulting emphasis on the use of artificial, processed ingredients that prove more amenable for the broad structure of the production system. The evolution of the fast food industry provides a specific example of the adverse consequences which eventuate. Notably, Gladwell (2001) illustrates how the considerable care for product quality, sourcing specific potato varieties, and the extensive scientific practice characterizing the production process of the fast food chain McDonald's allowed it to provide "the finest mass-market fries ever made." In fact, describing the dual emphasis on quality and consistency in the selection of ingredients, Ray Kroc, the founder of McDonald's, once wrote: "The French fry would become almost sacrosanct for me, its preparation a ritual to be followed almost religiously." Moreover, rather than a unique feature of this specific case, it is notable how the extensive care taken to locate and breed the ideal potato for production mirrors the description of Harvey et al. (2002: 160–163) with regards to the development of "the perfect tomato for tomato soup production." This quest for 'perfection' resulted in the promotion of the preparation method of deep-frying, owing to its ability to further enrich the carbohydrates of potatoes with fat and providing the texture demanded by consumers. However, it turns out that when vegetable oil – itself selected as a chemically stable, low-cost substitute for butter – is hydrogenated to be suitable for deep frying, trans fats are created. The consumption of this type of unsaturated fat has been specifically estimated to cause about 30,000 premature deaths a year in the United States, with a 2% increase in their consumption raising the risk for coronary heart disease in women by 93% (Gladwell, 2001). The selection of ingredients in order to conform to the broad desire for greater product consistency and quality control in the regime of industrial food production often results in the worrying emergence of novel health issues which must then be addressed.

With regards to the success factor of scientific expertise, two particular connections with the development of persistent problems can be established. For one, there is a pervasive emphasis on processing technology in the American regime of mass production in order to produce consistent and uniform food. It has been broadly established, however, that the centrality of food processing in this system has an inherently negative impact on nutrition, specifically occurring via the removal of essential nutrients. The processing of brown sugar into white sugar, for example, leads to an almost complete loss of calcium, iron, potassium, and niacin, whereas the canning of fresh tomatoes not only substantially decreases levels of vitamin C and beta-carotene, but causes the amount of sodium to increase by 2760% (Smith et al., 2011: 244). As a result, the diminished

nutritional quality of mass-produced food can be partly tied directly to the continued importance assigned to scientific expertise. The second connection between the incidence of persistent problems and this established success factor is seen in the pressure to increase the length of the supply chain. Recall in this respect that a longer supply chain is understood to enable the insertion of greater scientific expertise at each link, thereby ensuring greater quality control and product consistency (e.g. Andersen, 1994). And yet, in contrast to the viability of this strategy, it is important to remark how, parallel to the elongation of the supply chain, the incidence of foodborne illnesses seems to be increasing over time. In the year 2007 alone, for instance, food scares occurring in the United States included: the discovery of *e. coli* in ground beef, leading to the second-largest recall of beef in American history; the discovery of botulism in cans of chili sauce (including those of a major retailer), which represented the first case for commercially canned products since the 1970s; and the presence of salmonella in peanut butter, frozen pot pies, and spinach, prompting waves of recalls and hundreds of cases of food-related illnesses. More generally, the limited success in improving food safety is evidenced by the underwhelming progress in the last decade toward reducing the incidence of pathogens in food products, as monitored by the Centers for Disease Control and Prevention. Notably, in spite of the official significance assigned to this undertaking, only one of the nine targets to increase food safety has actually been met – and what is more, the incidence of salmonella, the pathogen most commonly causing hospitalization and death through the consumption of infected food products, has actually increased recently to now stand at nearly three times the established target (CDC, 2013).

Of course, it might be plausibly argued that the inability to reduce foodborne illness does not necessarily represent a problem which persists because of the continued reliance on scientific expertise. Nevertheless, the conditions for foodborne illness are paradoxically cultivated by the attempts to increase the length of the supply chain in order to ensure better food quality. As a result however, the initial inputs into this production process are seen to have diminished importance, motivated by the tendency to utilize technological expertise at the processing stage to ‘sanitize’ the standardized production inputs. The resulting effect on the agricultural sector can therefore be noted by the fact that the farm share of the food dollar has decreased from 30.9% to 15.8% over the last thirty years (Canning, 2011; Elitzak, 1999). In the first place, the downward pressure on production costs has tended to weaken the managerial role of farm operators, transforming them into more or less employees of the larger companies that supply them with the inputs to be produced according to pre-established

specifications and a pre-negotiated price (e.g. Conkin, 2008: 122). Consequently, rather than allowing all actors within the supply chain to effectively apply their particular skills, the emphasis on scientific expertise immensely restricts farmers from doing so. Furthermore, when the diminishing emphasis on agricultural production is coupled with the increasing globalization of supply chains, the opportunity is presented to producers to engage in fraudulent activity, most notably as a way to squeeze out some of the profits which are slowly diverted to other links in the supply chain. Hence, the strategy to increase the distance from field to fork cannot provide the basis for greater quality assurance, but instead makes it more difficult to monitor and thwart free-riding behavior of actors throughout the supply chain.<sup>14</sup>

Mirroring its substantial role within the newly-emergent regime of industrial food production at the turn of the 20<sup>th</sup> century, the success factor of scale production can also be broadly connected to a range of current persistent problems. In fact, finding evidence of this factor's relevance for the challenges that were salient in the societal context of the United States is far from difficult. Airing in 1968, the CBS News documentary 'Hunger in America' for instance drew substantial attention to the near-starvation conditions in which ten million Americans were living. The resulting outcry across the nation prompted a significant legislative and consumer response, including the reorientation of federal agricultural policy under Secretary of Agriculture Earl Butz. In particular, by urging farmers to 'get big or get out', the consequent rise in large-scale production did not simply help resolve the problem of food security, but moreover established the inopportune foundation for a number of negative consequences to later ensue. In this respect, Conkin (2008) describes how the significance of scale in agricultural production is recently fulfilled by the development of a self-propelled combine tractor containing features like a luxurious, air-conditioned cabin, a detailed nutrient map of every field harvest delivered by elaborate sensing technology, and an uplink to GPS technology in order to track the application of fertilizers. At a cost of more than \$250,000 per unit, it is readily apparent how the continuing pressure to 'stack scale on top of scale' to remain competitive makes it broadly impossible for smaller farmers to survive in the current economic climate of food production.

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<sup>14</sup> This is for instance borne out by the events of the recent scandal in the United Kingdom, where the actions of producers in Romania were found to be to blame for horsemeat, packaged as beef, finding its way onto the plates of British consumers.

Moving from agriculture to livestock production, recent decades have witnessed the further increase in the scale and intensity of this particular sector, exemplified by the development and subsequent proliferation of the organizational structure of concentrated animal feeding operations (CAFOs). Demonstrating its broad congruence with the ‘factory-like’ approach of industrial food production, this type of operation is characterized by high levels of productivity and efficiency, given how a large number of animals are confined in relatively small places, kept healthy by antibiotics, while organization is maintained by a combination of machinery and low-cost labor. Consequently, the manner in which the animals are ‘produced’ represents another application of the ideals of product consistency and quality control to food production. Owing to their strong general emphasis on scale, however, these operations are linked to: the incidence of disease epidemics and antibiotic resistance (Gilchrist et al., 2007); health risks to workers and consumers (Heederik et al., 2007); and diminishing water quality (Burkholder et al., 2007). In fact, with regards to the last point of environmental degradation, it has been recently established that the large-scale concentration of such activities in a localized area is one of the principal reasons that approximately a quarter of all groundwater bodies in the United States are found to have poor (and deteriorating) chemical status (DeSimone et al., 2014). As a further elaboration on the first issue moreover, the use of antibiotics initially became significant for such operations as a means to deal with the greater incidence of diseases in these confined spaces. While this application still remains important for ensuring livestock health, antibiotics have become increasingly relied upon owing to a number of other advantages, including the potential to facilitate further scale increases by overcoming the constraint of high animal stress levels and epidemics (Summons, 1968). Given their potential to cover up inherent systemic problems, standard practices in the rearing operations of poultry and hogs in the United States could be seen to register an increase of 70% in the amount of antibiotics consumed by livestock by the 1980s (Conkin, 2008: 116–119), with this trend continuing to grow even further in recent decades.

As such, in addition to concerns over animal welfare and the ethics of such operations, the problematic consequences of relying so heavily on antibiotics for non-therapeutic aims in livestock production are reflected in end products meant for human consumption like meat, milk, and eggs. Owing specifically to the potential for antibiotic-resistant germs to be transferred from livestock to humans (Schneider and Garrett, 2009), the potency of antibiotics as vital ingredients for maintaining human health now runs the risk of being diminished as a direct result of the scale-dominant methods and practices used for food production. In this



regard, although the possibility of achieving improvements in productivity and efficiency represents one potential reason for the over-use of antibiotics for livestock production, the emergence and subsequent persistence of this problem can also be explained by the prevailing motivation to mask the inherent shortcomings of the existing regime. This finally brings the historically-informed systems analysis of industrial food production full circle, given that the reasons for its initial emergence centered on the desire to address the widespread use of food adulteration in early 20<sup>th</sup>-century America (see Section 3.3). In specific, one reason that the emphasis of this regime on the factors of scale production, scientific expertise and standardization became so significant was because of their broad distinction from more problematic strategies and practices which were relied upon to mask the insufficiencies of the then-extant systems of food production. In a way, history therefore repeats itself, and just as the salient problems of this earlier period hastened the establishment of a new regime, so are there now emerging mounting questions about the continuing suitability of the broad approach of industrial food production within modern societies.

### 3.5 General conditions for transformation in food production

Having made the journey from the initial emergence of industrial food production through its continuing evolution to the present day, the foundation is established to discuss the general conditions for transformation in the food industry. Recalling the criticisms of the difficulty in the sustainability transitions to describe the mechanisms by which regimes emerge, the lessons drawn from the historically-informed systems analysis are specifically utilized to gain insights about how this dominant regime was established, and as a result the general process by which transformation to a new regime might occur. Profiting from the use of a problem-oriented understanding of regimes, this analysis makes explicit how many presumptions about the American system of industrial food production prove somewhat misleading once seen in the light of this regime's initial emergence. Notably, rather than a description in relation to the broad pursuit of improvements in productivity and efficiency, it is instead underscored how salient challenges such as food security and food safety were broadly featured in discussions of this system at the time of its emergence.

Germane to the broader transitions literature, it is therefore noted that specific technologies are seen to matter – or certain rules are relied upon to coordinate the activities of individual actors – because of their relevance for particular problems. On the one hand, it is implied that the characteristics of the technical production system are core aspect of regimes. While seeming to support the broad presumptions of approaches like technological paradigms and techno-economic paradigms, it must be noted however that the reasons are fundamentally different – with the more targeted emphasis on improvements in productivity and efficiency overlooking the fact that the selection of technologies and application of scientific principles is motivated by the specific function that regimes serve within societies. Instead of either some vague notion of regime rules or an exclusive emphasis on features of the technical system, the potential to attain the stability and unity of a regime – and thereby to achieve its emergence – is directly contingent on its being invested with a specific societal function. If we neglect to examine the problems and objectives that provide regimes with their explicit purpose, it is difficult to establish the unity and stability of regimes, let alone answer why a particular structure comes into being or how its stability is maintained over time.

Taking further stock of the historically-informed systems analysis, it is established in this regard that the fundamental relationship of industrial food production with the societal conditions of the early 20<sup>th</sup> century resulted in broader meaning being assigned to the new set of technical strategies which were essential to this regime. Owing to its association with both improvements in overall food quality and moreover the broader projects within society to ‘purify’ urban environments and impose uniformity and control over nature, the features of scale production, scientific expertise, and standardization took on the broader role of success factors in this regime. Notably, given the pervasive uncertainty of food safety in this context, these aspects were shown to be crucial for establishing the congruence between the technical system of production and the salient objectives which were extant in the societal context. In part, this relationship could be seen to emerge from the ability of these factors to distinguish the relevant producers from more problematic production practices, specifically concerning the association between food adulteration and smaller-scale, less scientifically-expert systems. As such, the features of large-scale production and advanced industrial methods were often utilized within brand reputations to communicate a broader commitment to product quality. Hence, it can be concluded that the potential for transformation can only be explained by the relevance of the broad features of the technical system for the dominant challenges of a specific societal moment.

The identification of specific success factors is therefore useful in two different respects. First, given their centrality to the regime's continued evolution, these aspects help to make sense of the enduring template for innovative activity in the food industry, explaining for instance why gains in productivity and efficiency continue to be emphasized to such an extent. Second, the fundamental role of these success factors within the regime of industrial food production is also able to explain why problems have emerged in the food industry over time. In specific, as reflected in the notion of persistent problems (e.g. Schuitmaker, 2012), it is established that many problems in the food industry are difficult to resolve on account of their connection with the evolved structure of the dominant regime. That is, problems are said to persist because they are the unintended consequences of the continued reliance on established success factors to overcome any problems that may emerge. In this regard, the technical and organizational approach of industrial food production is seen to still pursue a particular understanding of quality production, for the purposes of which it not only emerged but has been further fine-tuned and evolved over time. Nevertheless, as a result of the advent of new challenges and objectives in the societal context as well as new conceptions of food quality, this more 'historic' definition of quality production has become somewhat outmoded and no longer sufficiently specific to function as the foundation for quality innovation seeking to foster improvements in the desired directions.

If we wish to tackle the problems currently confronting food production, it is therefore necessary to entertain the possibility of establishing a new regime of food production, that is, one whose structure is not so entangled with problems such as limited sustainability, questionable food safety, and moreover their increasing costs for American society. By explaining the structure of persistent problems in the food industry, the foregoing analysis is able to provide broad insights into the potential for transformation, most notably regarding how the regime of industrial food production is itself responsible and, in a similar fashion, why such problems are becoming increasingly prevalent. On the one hand, due to the negative relationship between this regime and various persistent problems, it might be suggested that industrial food production cannot be expected to play a major role in the ongoing transformation in the food industry. That is, the fact that so many of its key features are seen to make matters worse suggests the need for caution with regard to the ability of this system to represent a way forward for food production. This suggestion is not explored more fully for a number of reasons. In the first place, the substantial evidence throughout economic history of the random, unexpected nature of innovation suggests the value of circumspection

when it comes to making broad statements about the future viability of a given system. Moreover, among the many lessons of the historically-informed systems analysis, it is demonstrated that there is no one definitive answer for either the source of persistent problems or how they are to be resolved. Rather, such answers are determined by processes of deliberation and consensus-finding in democratic societies, making it necessary to keep in mind that broad processes of transformation in society are ultimately open-ended and with a host of contesting viewpoints on what transformation requires, and how it is to be pursued.

For this reason, it is argued that, rather than emphasizing the features of the regime or how it might be changed, it is more important to explicitly consider the conditions necessary for new regimes to emerge. Making use of the insights of the historically-informed systems analysis, three fundamental conditions can thus be discerned which are able to establish discussions of the current transformation in the food industry on more solid ground. First, in a very general sense, it is necessary for a given regime to have sufficient technical expertise to provide the specific qualities which are desired. Although important to mention this aspect, it must be noted that this condition is less pertinent for the food industries of wealthy, industrialized nations given how developed the technical capacity of food systems is at present – not forgetting how increasing scale production and scientific expertise are actually seen to foster persistent problems. Second, it is necessary that a regime and its underlying practices are able to be distinguished from approaches which are seen to be problematic in a given societal context. Regarding the emergence of industrial food production, this condition was represented by the need to be seen as distinct from the strategy of food adulteration, with its detrimental impact on the overall quality of food. Third and finally, it is necessary to establish coordination between salient expectations of product quality, and the central features and aspects of the regime considered. In the case considered in this chapter, the importance of this condition is evident from the broad effort devoted to establishing a consensus on quality production in the food industry, specifically on terms that were generally beneficial for the approach of industrial food production. Since regimes like this one can thus be characterized as representing broad solutions to the dominant challenges in a given societal moment, their establishment is contingent on their developed capacity to orient the activities of individuals throughout the regime around particular understandings of product quality. In sum, regarding the potential for transformation in the food industry, it is not sufficient that a technology, rule, principle, or organizational method is potentially relevant for a specific set of challenges in the social context – and their related expressions in product qualities

– but rather that the application of such factors is able to make a quality known and evident. In other words, the importance of establishing food production around a changing understanding of food quality and safety makes it necessary to understand how emergent quality expectations can be infused into the activities of the production system and its products.

The manner in which new quality expectations are founded at the heart of regimes has not yet been sufficiently considered, either in relation to the food industry or sustainability transitions more generally. For this reason, future research is needed to explore the more ‘practical’ issues which must be addressed in order to make a quality ‘known’, perhaps using insights from the literature on credence goods and quality verification to establish the mechanisms and strategies through which the credibility of quality claims can be improved (e.g. Darby and Karni, 1973; Dulleck and Kerschbamer, 2006; Dulleck et al., 2011; Jahn et al., 2005). Using a more sociological and systems-level perspective, Zachmann (2011: 79) observes with regards to processes of trust creation how “trust is a way to reduce complexity ... via generalizing expectations in the behavior of others by superseding missing information with an internally guaranteed safety.” It can be suggested as a result that, rather than considering the credibility of quality claims on their own, it is the logic of the entire regime which proves essential for developing trust and the internally guaranteed safety necessary to integrate new meanings into food consumption. For this reason, the question ‘What are the necessary conditions for transformation in the food industry?’ can be posed in a slightly different manner to instead consider ‘How are new meanings infused into the activity of food consumption?’

Incidentally, the unique approach to regimes shown in this chapter also makes it possible to reflect on how the meaning of consumption activities can evolve over time, and what is more, how this is relevant for broader processes related to sustainability transitions. Taking up a more focusing look at the demand side of the food industry, it can be remarked that it is ultimately the capacity to satisfy the needs and wants of individuals that is most relevant for the evolution of consumer preferences (Witt, 2001). Hence, it can be suggested that much of the uncertainty surrounding transformation in the food industry is broadly related to the notion that the task of food production has already achieved its principal aim. That is, by attaining an adequate and affordable food supply, it is largely unnecessary to entertain any modification to the existing template of innovation. As made clear throughout this chapter, however, the evolving relationship between the dominant regime of industrial food production and the broader societal context is essentially

driven by changes in the understanding of what is required of food production. Since the meaning of consumption activity represents an actor-level perspective of this broader shift in the societal function of food production, the greater scope for innovation in this meaning must not therefore be overlooked.

## Chapter 4

# How Where I Shop Influences What I Buy: The Importance of the Retail Format in Sustainable Tomato Consumption

### 4.1 Introduction

Transformation in agricultural production is widely identified as one of the key mechanisms available to mitigate the threat of climate change (Nauc ler and Enkvist, 2009).<sup>1</sup> This assessment results to a large extent from the awareness that the agricultural sector accounts for 22% of all global greenhouse gas (GHG) emissions – a share equal to all industrial production and more than the entire transport sector (McMichael et al., 2007).<sup>2</sup> Moreover, the methods common to industrial agriculture are associated with environmental degradation in the form of air pollution, water contamination, and diminishing soil quality. The environmental and health-related costs of large-scale pesticide use alone annually amount to \$12 billion in the United States, with the additional impact of soil erosion estimated to exceed another \$45 billion (Pimentel, 2005; Pimentel et al.,

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<sup>1</sup> The paper on which this chapter is based is co-authored with Dr. Robert Weigelt. We would like to give special thanks to Anna-Lena Brede for outstanding research assistance and Dr. Thomas Baumann for lending his technical expertise throughout the process. Finally, we would like to give thanks for the many thought-provoking comments from the participants at the 2014 International Conference on Applied Psychology in Paris.

<sup>2</sup> When considering the broader impact produced via agriculture-driven deforestation, the emissions share might even be as high as 35% (Stern, 2007). Similarly, further research has argued that livestock production could account for more than half of all global emissions once all consequences are considered (Goodland and Anhang, 2009).

1995). Reducing the detrimental impact of agricultural production is thus a prominent aspect of the broader transition to more sustainable societies.

On a smaller scale, individuals wishing to improve the sustainability of their lifestyles are often therefore motivated to make changes related to food provisioning and consumption. Mirroring the rise in markets for alternative products, one of the most common strategies for becoming more sustainable is to purchase food that is produced in a more ethical and environmentally-conscious fashion. Linked to growing concern over the widespread application of pesticides, for instance, global sales in organic food and drink grew fourfold between 1999 and 2010 to recently surpass \$64 billion worldwide (Sahota, 2014). Furthermore, built on the promise of fairer wages for farmers in developing countries, the market for fair trade-certified products now stands at \$8 billion globally (Fair Trade, 2014). The expansion of organic and ethical consumer behavior is therefore a reflection of the types of concerns that are increasingly relevant for food production.

Simply highlighting the extensive growth in sustainable consumption is not sufficient to explain what is driving the growth in such markets. On the one hand, given that such products are likely to cost more, it is informative that a substantial proportion of individuals claim to be willing to follow through on their favorable attitudes by also being prepared to pay more for sustainable products (Adlwarth and Kecskeks, 2014). Owing to the increased awareness of the adverse consequences of industrial agriculture, there appears to be growing trend towards increasing food budgets to purchase higher-quality products. Nonetheless, since the actual growth in sustainable consumption is chiefly driven by a small set of dedicated consumers (Padel and Foster, 2005; Pearson et al., 2011), it is necessary to underscore that behavioral change takes place unevenly across consumers. As a result, an important initial step for the promotion of sustainable behavior is to understand why there is such substantial preference heterogeneity among individuals.

Until recently, economic investigations of consumer behavior have typically taken a revealed-preference approach that focuses on actual consumption. However, given the relative novelty of markets for sustainable products, it is highly likely that consumer knowledge of product attributes is not sufficiently developed. Hence, explanations using stated preferences offer more insight into the latent demand for sustainable food which is not yet expressed in actual behavior. In fact, methodological approaches of this type rank among those most popular for exploring preference heterogeneity in sustainable consumption. Notably, given



that the development of novel markets is generally contingent on the existence of sufficiently high premiums, such approaches can usefully elicit how much consumers are willing to pay. Further, in the case of discrete choice experiments (DCEs), it is possible to look into preference heterogeneity on a finer level by presenting individuals with a set of choice tasks which ask them to choose among products described in terms of their component attributes. This method thus makes it possible to consider how individuals differ in terms of their willingness to pay (WTP) for organic, fair trade, and local production, respectively, in a way that also approximates actual consumption as best as possible.

Nonetheless, discrete choice experiments have been used only rarely to explore sustainable consumption. By way of explanation, it must be noted how the manner of using such methods can be improved in some crucial respects. First, due to the emphasis on product qualities in the literature, there is limited attention to the retail formats where products are actually purchased. And yet the importance of taking into account differences between retail formats is increasingly apparent given how the rise in organic sales is often explained in relation to the growing involvement of large retailers and supermarkets (Dimitri and Oberholtzer, 2009; Greene et al., 2009). Additionally, the fact that the development of organic and ethical production practices is accompanied by the emergence of alternative formats such as farmers' markets and independent natural food retailers serves as further illustration.

For this reason, this study conducts a hypothetical discrete choice experiment with opt-out option to explore how retail formats matter for sustainable tomato consumption. The experiment is purposely designed to consider two potential mechanisms through which retail formats might be relevant. First, to explore the possibility that the type of retail format has a direct impact on consumption, three distinct retail formats are represented in the set of choice tasks: discounters, supermarkets, and independent organic retailers. Alongside the attributes of price and production-related attributes such as organic, fair trade, and source of production, the type of retail format is therefore included as an integral element of purchasing decisions. Furthermore, by allowing for interactions between retail formats and the distinct quality attributes, this design makes it possible to explore how where consumers shop influences their purchasing choices in this manner as well. On a final note, this study is also the first in the sustainable consumption literature to make use of an individually-specified status quo to make choice tasks more reflective of actual consumption decisions. By increasing the degree to

which the status quo corresponds to individuals' life situations, it becomes possible to improve the accuracy of the WTP estimates that are derived.

The next section reviews the literature on sustainable food consumption before arguing why the type of retail format matters. Section 4.3 describes the design of the discrete choice experiment in detail. Section 4.4 provides insight into the data collection process and summarizes the socio-demographic characteristics of the sample. Section 4.5 describes the mixed-logit model with two-way interactions specification which is used for the empirical analysis. Section 4.6 presents the results and provides a discussion. Section 4.7 summarizes the chapter and outlines future research.

## 4.2 Determinants of sustainable consumption

Explanations of the growth in sustainable consumption typically seek to give an understanding of why individuals purchase such products. For example, the rising demand for organic products can be broadly linked with concern over the health and safety of conventionally produced food (e.g. Yiridoe et al., 2005). In this regard, growing awareness of the prevalence of pesticides and chemical residues in the food supply represents one specific area of consumer concern. In a meta-analysis of the literature, pesticide residues were detected for 38% of conventional produce samples in contrast to only 7% of organic samples (Smith-Spangler et al., 2012). Furthermore, a survey of food production in the European Union (EU) found that not only were 41% of conventional produce samples minimally contaminated by chemical residues, but that almost 5% of samples exceeded the legal maximum level (EU-DG SANCO, 2007).<sup>3</sup> Another reason for the increasing popularity of organic food is the perception that such products have superior nutritional benefits. Though often contested, there is substantial research that demonstrates a link between organic systems and a range of quality parameters (Lester and Saftner, 2011; Mitchell et al., 2007; Oliveria et al., 2013; Zoran et al., 2014).<sup>4</sup> In specific, conducting a meta-analysis of 343 studies, Barański et al. (2014) conclude that organic food benefits from reduced exposure to nitrogen, toxic heavy metals, and pesticide residues, along with significant increases in

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<sup>3</sup> A recently-released report determines that the amount of samples above the legal limit has fallen below 3%, while samples which contained measurable residues within legal limits has increased to almost 43% (EFSA, 2015).

<sup>4</sup> In particular, these studies establish that organic systems are likely to have greater concentrations of nutritionally-relevant vitamins and antioxidants and a lesser content of potentially toxic nitrates.

antioxidants. Accordingly, the health impact of switching to organic produce is described as being equivalent to eating an additional one to two portions of fruit and vegetables a day.<sup>5</sup>

Emerging scientific evidence of the advantages of organic vis-à-vis conventional production systems lays the groundwork for more and more individuals to choose to consume sustainably. To directly facilitate sustainability transitions, however, it is not sufficient for higher potential for sustainable consumption to exist if this potential is not actually realized in individual behavior, and what is more the incidence of this behavior on a large scale. While it is common to highlight the extensive growth in organic and fair trade sales, it can easily be overlooked that such growth predominantly results from the activities of a minority of consumers (Padel and Foster, 2005; Pearson et al., 2011). In other words, the extensive growth in the market for sustainable products more accurately represents the intensive development in the consumption of a few individuals. In order to understand what makes this group unique, one strand of research has attempted to deliver valuable insights into sustainable consumption by constructing profiles of sustainable consumers. Featuring prevalently in such attempts, there is an extensive reliance on socio-demographic characteristics such as age, gender, education, and income to explain why some individuals consume sustainably whereas others do not (e.g. Govindasamy and Italia, 1999; Yue and Tong, 2009). Unfortunately, the impact of demographic factors on actual behavior has proven generally ambiguous (Li et al., 2007; Yiridoe et al., 2005), making it necessary to improve the accuracy of consumer profiles by including a number of psychological factors. In particular, the identification of motivational factors such as environmental concern, the importance placed on others' well-being, and individuals seeing themselves as competent enough to perform the required tasks has established in greater detail why some individuals are more likely to engage in sustainable consumption (e.g. Bond et al., 2008a; De Pelsmacker et al., 2005; Nurse Rainbolt et al., 2012).

Following from the greater attention to motivational factors, there is closer consideration of the types of motivations which distinguish those individuals who consume sustainably more often. In this regard, Lusk and Briggeman (2009) find sustainable consumers to be distinguished by the existence of 'food values'

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<sup>5</sup> Brandt et al. (2011: 193) similarly conclude that "switching to organic fruits and vegetables would correspond to an increase in life expectancy of, on average, 17 days for women and 25 days for men." For the sake of comparison, the authors note that breast cancer screening is estimated to increase life expectancy by 35 days.

related to environmental impact, naturalness, and the use of modern technologies. While articulated in the language of values, each of the dimensions also reflects a particular criticism leveled against industrial food production. Beyond the typical associations with environmental impact, the decision to purchase organic food is also shown to be motivated by considerations such as taste, animal welfare, and the plight of local farmers (Hughner et al., 2007). Hence, in view of the manifold reasons which emerge, it often proves difficult to provide a ‘one-size-fits-all explanation’ of why sustainable consumption does (or does not) take place.

To explain the extensive preference heterogeneity between individuals, the field of economics is gradually making greater use of stated preferences to establish which features of sustainable food production are most relevant. In particular, there are a growing number of studies which are using contingent-valuation methods to explore the foundations of sustainable consumption. In order to establish the types of qualities which consumers hold to be most important, this type of method generally relies on the characteristics approach of Lancaster (1966). As such, since products are taken to be comprised of distinct attributes, it is possible to consider the extent of the demand for qualities such as organic, fair trade, and local production in isolation from each other. Moreover, in such studies, the value that is associated with a particular quality is typically expressed as the amount that individuals are willing to pay in order to purchase it. Given the extent of this market, studies exploring willingness to pay (WTP) have typically focused on organic food with relevant estimates having been provided for: potatoes (Loureiro and Hine, 2002); tomatoes (Onozaka et al., 2011); apples (Rousseau and Vranken, 2011); processed baby foods (Peterson and Li, 2011); and processed blueberry products (Hu et al., 2009). Other studies have similarly looked into the value of coffee with a fair trade label to establish the importance assigned to providing producers with a more equitable share of the profits (De Pelsmacker et al., 2005; Loureiro and Lotade, 2005). Reflecting the value of improving the working conditions of farmers closer to home, it is also shown that individuals are willing to pay as much as 68% more for domestic, fair-trade strawberries (Howard and Allen, 2008). Meanwhile, it is revealed that individuals are not only willing to pay a substantial premium for food that is locally produced (Carpio and Isengildina-Massa, 2009; Dentoni et al., 2009), but moreover that this premium might potentially amount to between 48% and 118% more when contrasted with food of unknown origin (Darby et al., 2008).

By determining how much individuals are willing to pay, contingent-valuation methods can also explore whether demand is sufficiently large to support

sustainable production. In specific, it is for this reason that the attempt is frequently made to assign a numerical value to the importance of animal welfare and the quality of life of other species, sometimes with the explicit intention of promoting particular types of regulation in livestock production (Bennett, 1997; Bennett and Blaney, 2002, 2003; Bennett et al., 2002; Howard and Allen, 2010; Vander Naald and Cameron, 2011). Similarly, though such a label is not yet widely established, the potential introduction of a ‘domestic’ fair trade label to identify products grown by farm workers who enjoy fair and safe working conditions is also considered using stated-preference methods (McCluskey and Loureiro, 2003). If we wish to accurately assess the viability of potential markets, however, it becomes necessary to take into account the potential interaction effects between the distinct quality claims which are made regarding sustainable production. Without the consideration of complementary or substitution effects, the WTP estimates are very likely to be biased given how closely related the various attributes are. And yet, only a few studies have so far examined such interactions (Bond et al., 2008b; Meas et al., 2014; Onozaka and Thilmany McFadden, 2011; Yue and Tong, 2009). For instance, Bond et al. (2008b) establish that the premium which individuals are willing to pay for a product with organic, local, and nutritional claims is only slightly higher than one advertising only one claim. Similarly, Yue and Tong (2009) show that the attributes of local and organic production, though separately worth \$0.67 each, can together obtain a total premium of only \$1.06. In contrast, Onozaka and Thilmany McFadden (2011) find no interaction between the attribute pairs of ‘local and organic’ and ‘organic and fair trade’, illustrating that the effect of the attributes occurs independent of one another. A positive interaction between local and fair trade is however established in this study, which is taken to suggest that ethical standards are valued more highly when they benefit local farmers. In sum, appreciating how quality attributes can be complements or substitutes for each other offers additional insight into sustainable consumption.

What is more, when the interaction between how food is produced and where it comes from is specifically considered, further insight can be provided regarding the importance for sustainable consumption of those aspects related to supply chain organization. In this regard, it is necessary to note that the amount an individual is willing to pay is not determined by the presence of a label on its own or even the existence of a given quality in the product. Instead, owing to the limited ability of consumers to directly verify whether credence attributes such as organic production and country of origin are actually present (Darby and Karni, 1973), individuals must evaluate quality by referring to the perceived credibility

of the sellers involved. Accordingly, the organization of the supply chain assumes further significance given that consumers require additional assurance about the existence of product quality. In specific, it has been noted that individuals tend to rely on locality as a signal to infer quality more generally (Darby et al., 2008; Dentoni et al., 2009; Thilmany et al., 2008), showing that the fact that a product is locally produced is therefore seen to provide greater certainty regarding the level of product quality. In this regard, the specific allure of local products has been linked with the impression of more visible and thus safer supply chains (Henseleit et al., 2007; Meyer and Sauter, 2004; Moser et al., 2011).

Nevertheless, there are limits to the ability to rely on locality alone. Notably, it is established in the literature that individuals only assign value to the source of production when that country or locality is actually associated with higher quality (Loureiro and Umberger, 2003, 2007; Verbeke and Ward, 2006). Instead of reflecting the value of locality on its own, if individuals are willing to pay more for food that is transported a shorter distance (Grebitus et al., 2013) or which comes from smaller farms (Darby et al., 2008), it results from the perceived association between shorter supply chains and quality production. Hence, it is necessary to consider other features of the supply chain which might also facilitate quality evaluation. Generally speaking, certification systems and labeling schemes are seen to fulfill the significant function of providing consumers with information about quality (e.g. Caswell and Mojduska, 1996; Caswell and Padberg, 1992). Due to the existence of fraudulent claims in organic and fair trade certification (e.g. Giannakas, 2002), however, the presence of labels alone often provides an unsteady foundation for inferring product quality. For this reason, Olynk et al. (2010a) explore how the perception of process-related attributes in livestock production can vary depending on the entity providing quality verification. In specific, since consumers cannot directly verify claims related to antibiotic use, pasture access, and use of gestation crates, it is shown that they are willing to pay more when verifications is, for instance, provided by a public regulatory authority rather than producers themselves or a private, third-party certifier.

Nonetheless, in spite of the increasing attention to the relationship between quality evaluation and supply chain considerations, no study to our knowledge has explicitly explored how the retail formats where products are sold might matter. And yet, such a perspective would seem relevant given that retailers are increasingly responsible for providing quality assurance in global supply chains (Busch and Bain, 2004; Harvey et al., 2002). What is more, the type of shopping

venue is shown to represent one of the most significant determinants of organic consumption (Thompson and Kidwell, 1998; Zepeda and Li, 2007), not to mention having a significant impact on quality perception and price sensitivity (Umberger et al., 2009; Hsieh and Stiegert, 2012). However, the potential to better understand how retail formats matter is typically limited in two respects. First, there is a limited conception of the relationship between retail formats and consumer behavior due to the tendency to characterize formats in economic terms such as the distance to be traveled and the cost and variety of the consumption bundle (e.g. Hsieh and Stiegert, 2012). Second, borne out of the desire to provide marketing advice (e.g. Yue and Tong, 2009), the implicit intention to segment consumers on the basis of where they shop makes it difficult to explain how the habit to shop in a particular format initially emerged.<sup>6</sup> As a result, while the attention to differences in retail formats represents a step in the right direction, it still remains difficult to explain why, for example, a strong association exists between sustainable consumption and the tendency to shop at alternative retail formats (Keeling-Bond et al., 2006; Onozaka et al., 2011). In order to address this significant gap in the literature, it is therefore necessary to directly consider how the type of retail format matters for sustainable consumption.

## 4.3 Designing the discrete choice experiment

### 4.3.1 Theoretical considerations

Contingent valuation (CV) methods are touted for their ability to explore the potential demand for products for which established markets do not yet exist. In particular, such methods are useful to explain not only why a market has failed to materialize but also the extent of the market that might exist under different circumstances (e.g. Arrow et al., 1993; Kahneman and Knetsch, 1992; Turner et al., 2002). Offering a description of the general approach, Carson (2000: 1414) clarifies how CV surveys “can create an idealized market for a pure public good whereby respondents face a choice between two different quantities of the good [with] the usual example [comparing] the status quo level of the good versus an alternative level that will entail a specified cost increase.” The relevance of such an approach for exploring organic and ethical consumption is thus demonstrated

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<sup>6</sup> In contrast, Li et al. (2007: 65) argue that the fact that sustainable products are now widely available makes it difficult to “presume that shopping venue is endogenous to the decision to buy organic food.”

in a number of respects. Most prominently, whether pursued using conjoint analysis, auction experiments, or discrete choice experiments, the act of choice remains a central feature of how these approaches explore the significance of public-good attributes.<sup>7</sup> Further, this description identifies two specific components which are critically relevant: (1) the experimental design of the choice task, principally the attributes used to characterize products; and (2) the specification of the status quo. Some background is briefly provided on each of these aspects.

The experimental design in this study takes the form of a discrete choice experiment (DCE). This method presents consumers with a set of choice tasks which ask them to choose among products described in terms of their component attributes. Given that products are seen to be composed of attributes, it becomes possible to generate new products by changing the levels of the underlying attributes. In this manner, we can determine how much individuals are willing to pay for product qualities such as organic, fair trade, and local production. In addition, the potential to choose among a set of products, each representing a distinct constellation of attributes, provides the opportunity for individuals to express their preferences to a greater degree than possible using other methods. For example, DCEs are superior to conjoint analysis in this regard given that the instead asks individuals whether they would pay a specific price for a product. As a result, rather than reflecting a choice among different options, the choice task is focused on exploring how much individuals are willing to pay for a product that has been previously chosen for them.

Moreover, the fact that this method cultivates a decision-making process where price is the most salient consideration is especially problematic given the desire to explore consumer demand for more qualitative attributes. For this reason, one of their principal advantages is that DCEs are more generally reflective of how individuals actually make consumption decisions. The contrast with experimental auctions is illustrative in this respect. First, it should be noted that this method is well-regarded given that it can involve the exchange of real money and real food (Bernard and Bernard, 2009; Grebitus, et al., 2013). In contrast, studies in behavioral economics have provided evidence that preference reversals can occur when an individual engages in bidding rather than choice (Lichtenstein and Slovic, 1971; Slovic and Lichtenstein, 1983; Slovic et al., 1982). Hence, since

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<sup>7</sup> It should be noted, however, that the processes used to derive the specific WTP estimates, although related in terms of philosophical approach, differ quite strongly from approach to approach owing to the different circumstances of the choice setting. This provides cause for being wary of directly comparing the different results.



bidding is specifically motivated by winning, it represents a mechanism for decision-making that is not analogous to choice, and which potentially leads to distinct choice outcomes.

In order to provide an appropriate choice setting, this study utilizes a hypothetical discrete choice experiment with opt-out option to explore sustainable consumption. Given its advantages, it is somewhat surprising that discrete choice experiments are so rarely used. To the best of our knowledge, only seven studies exist based on a similar approach. The products considered in these studies include: apples (Rousseau and Vranken, 2011); apples and tomatoes (Onozaka and Thilmany McFadden, 2011); red leaf lettuce (Bond et al., 2008b); processed blueberry products (Hu et al., 2009); processed blackberry jam (Meas et al., 2014); and hormone-treated beef and genetically-modified corn (Lusk et al., 2003). As already mentioned, only three of these studies examine potential interactions between the different quality claims (Bond et al., 2008b; Meas et al., 2014; Onozaka and Thilmany McFadden, 2011). Furthermore, of the few studies using DCEs to investigate sustainable preferences, only Olynk et al. (2010a) consider how the source of verification information influences the significance assigned to process-related attributes in livestock production. Nonetheless, none of the studies in the literature consider the importance of the retail formats where sustainable products are sold, nor for that matter the potential interaction between such formats and quality claims.

#### 4.3.2 Attributes and attribute levels

The selection of the attributes that comprise the products was determined via an extensive review of the literature on sustainable food consumption. To facilitate comparison with other studies using DCEs, four of the five attributes are quite familiar: price; product origin; organic production; and ethical standards. For reasons already enumerated, the type of retail format is also included. As part of the experiment, it is necessary to provide some background information about the attributes and attribute levels. This is done to both clarify what is meant by the various terms and to address the fact that some individuals might not be so familiar with sustainable consumption. All descriptions were pre-tested to ensure comprehension and a lack of bias in one direction or another. The attributes and their particular levels can be seen in Table 4.1.

**Table 4.1: Attributes and attribute levels**

| Attribute          | Attribute levels   |
|--------------------|--|
| Price per 500g     | 1.50 €; 2.50 € (Status quo)<br>1.00 €; 2.00 €; 3.00 € (Alternatives) |
| Country of origin  | Local (Thuringia)<br>Mexico<br>Spain                                 |
| Retail format      | Organic retailer<br>Discounter<br>Supermarket                        |
| Organic production | Organic<br>Conventional  |
| Ethical standards  | Fair<br>Not fair   |

Furthermore, in order to specify the status quo for each participant, it is necessary for individuals to describe the type of tomato they typically consume. We describe the specification of the status quo in the next section. It is relevant at this point to note, however, that the two distinct rows for the price attribute are a consequence of the need to ensure that the products in the choice tasks are not identical in all respects, no matter the other decisions made by participants. The levels of this attribute reflect the price of 500g of red round tomatoes and are chosen after undertaking an exploration of the market in the relevant city. Similarly, the three levels for the attribute of origin are also indicated for reasons of familiarity in this context. Accordingly, Spain is chosen because it is not only one of the most prominent exporters of tomatoes to Germany but is also a member of the EU. In contrast, Mexico is utilized as a representative of production originating from non-EU nations as well as for reasons of travel distance. Finally, the region where the survey is conducted, i.e. Thuringia, is included to represent tomatoes of local origin. In this regard, it is important to note that this region is one of the largest producers of tomatoes in all of Germany.

Regarding organic production, a brief description is provided which draws on the definition of the European Union and, more generally, that of the International Federation of Organic Agricultural Movements (IFOAM). Namely, it is highlighted that organic production reflects a commitment to production techniques that place a greater emphasis on ecological processes and natural cycles, along with the restricted use of synthetic and chemically-intensive inputs including pesticides, fertilizers, and additives. Similarly, the explanation of ethical

standards is developed in a manner reminiscent of ‘Fair Trade’ and the commitment to more equitable terms of trade. In specific, the term ‘fair’ reflects compliance with a set of ethical standards which promotes fair working conditions and a guaranteed minimum price for farm workers.<sup>8</sup>

Finally, given its novelty, further discussion of the ‘retail format’ attribute is in order. First, three different levels are provided for this attribute: discounter, supermarket, and independent organic retailer.<sup>9</sup> These formats are selected for their familiarity in the German market as well as the noticeable differences between them. Accounting for the possibility that individuals might simply rely on existing perceptions derived from their experiences with specific retailers, abstract descriptions of retail formats are provided that concentrate on aspects such as store size, product variety, price level, and ownership structure. Such descriptions were developed on the basis of established definitions in the retailing literature (e.g. Herrmann et al., 2009; Wortmann, 2004). For instance, supermarkets are characterized as being the largest of the formats, having the widest variety of products for sale, and having access to national or international distribution networks as a consequence of belonging to corporate chains. Discounters are identified by their emphasis on low prices, a more limited selection of products and smaller overall size, as well as having less advertising and fewer service personnel than supermarkets. Finally, organic retailers are distinguished in two specific respects: (1) the entire product assortment is oriented toward a single quality; and (2) they tend to be independently owned and operated. It is further mentioned that the latter aspect can sometimes lead to closer partnerships with small-scale producers and, correspondingly, a higher percentage of local and regional products.

### 4.3.3 Specification of the status quo

Representing the baseline against which product alternatives are compared, the status quo is an integral aspect of the discrete choice experiment. To derive accurate estimates of willingness to pay, it is therefore important that the status

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<sup>8</sup> The use of a label is eschewed in favor of the terms ‘organic’ and ‘fair’ to reflect organic and ethical standards in the experiment. Labels are avoided due to the familiarity that often accompanies them and the fact that individuals have been found to place value the label itself, irrespective of what it actually conveys (e.g. Lotz et al., 2013).



<sup>9</sup> The corresponding description of ‘independent organic retailer’ in German is the more familiar ‘Biomarkt’. Hereafter, the shorter form of this longer description, namely ‘organic retailer’, is used with no change in meaning.

quo be as reflective of individual consumption histories as possible. In the existing literature, however, it is common to assign a fixed status quo that perhaps represents the product that is most purchased in a particular context. For example, whether a participant has never tasted a cup of Fair-Trade coffee or purchases all of his or her food at a farmers' market, the status quo remains unchanged. Furthermore, by failing to take into account the variety of consumption histories, it is exceedingly difficult to explore the preference heterogeneity of individuals in this domain. Concerning the choice experiment, moreover, it is conceivable that the use of an unfamiliar status quo might confound the ability of participants to respond accurately, thereby limiting the validity of the conclusions that are attained.

For this reason, this is the first study in the literature to enlist the help of individuals to specify the status quo. After being provided information about the distinct attributes and attribute levels, individuals are requested to select the level for each attribute which best reflects their typical consumption behavior. For instance, individuals are asked whether they tend to pay 1.50€ or 2.50€ for 500g of tomatoes. The same procedure is then replicated for each of the attributes to ultimately deliver a participant's typical tomato. The use of an individual-specified status quo is notable for a number of reasons. First, it reduces the overall complexity of the experiment for participants by providing a familiar baseline against which alternatives can be compared. Further, the additional step of identifying one's tomato could foster a sense of ownership which makes the decision to tradeoff from the status quo slightly more realistic. In this respect, the change in how the status quo is specified also makes the interpretation of the results easier. Specifically, the central purpose of a choice experiment is to understand what combination of attributes is required to encourage individuals to forsake the familiarity of their status quo and instead try something different. By relying on information about actual consumption histories to construct the status quo it is possible to make choice tasks more reflective of decisions made in the real world and thereby improve the accuracy of the derived willingness-to-pay estimates. As an aside, it is also possible to provide information about the types of tomatoes typically purchased in this region, or at least what individuals perceive this tomato to be.

#### 4.3.4 Description of the experimental design

Within each choice task, participants are shown two identical tomatoes which vary in terms of the attributes already mentioned: price (per 500g), product origin, organic production or not, ethical standards or not, and the retail format where they are offered. Participants are told that tomatoes are otherwise identical. An example of the choice task is shown in Figure 4.1. Note that ‘Tomato A’ corresponds to the status quo formed from the answers earlier in the survey and thus remains the same for all choice tasks, while ‘Tomato B’ varies throughout. Furthermore, individuals are given an ‘opt out’ option to purchase neither product. As such, each choice task includes three potential options. The inclusion of an opt-out option in choice experiments is increasingly recommended in order to increase the realism of the choice setting and obtain as much information as possible about individual preferences (e.g. Adamowicz and Boxall, 2001; Batsell and Louviere, 1991; Carson et al., 1994; Louviere et al., 2000). Further, without the option of not making a choice, individuals are often forced to state preferences which ultimately diverge from their actual purchasing behavior by causing them to rely on simplifying heuristics (see Kontoleon and Yabe, 2003). As a result, if such an option were not provided, there would be reason to doubt the validity of not only the experimental results but also what can be inferred from the resulting willingness-to-pay estimates.

|  |                          |  |                                |
|--|--------------------------|--|--------------------------------|
| There are three choices available: Buying one of the two tomatoes described below or choosing neither of them. Please mark only one box. |                          |  |                                |
| Tomato A   |                          | Tomato B   |                                |
|   |                          |  |                                |
| 2.50€ / 500g   |                          | 2.00€ / 500g   |                                |
| Local  |                          | Spain  |                                |
| Organic retailer   |                          | Supermarket  |                                |
| Organic  |                          | Organic  |                                |
| Fair   |                          | Fair   |                                |
| Please choose one:   | I would buy tomato A.    | I would buy tomato B.  | I wouldn't buy either of them. |
|  | <input type="checkbox"/> | <input type="checkbox"/>   | <input type="checkbox"/>       |

**Figure 4.1: Example of the choice task**

When generating the product profiles for the choice tasks, it is first determined that the standard full-factorial design is not appropriate (see Hensher et al., 1999). The standard design generates a full set of product profiles which is comprised of all the possible constellations of attribute levels. However, as the number of attributes and attribute levels increases, and along with them the number of potential combinations, the load on participants increases exponentially. While dividing the possibilities into blocks might provide a partial solution, the existence of three price levels, three sources of production, three retail formats, and two alternatives for both organic and fair trade produces a total of 108 different combinations. Accordingly, though the reliance on a fixed status quo substantially simplifies the set of possible pairwise combinations, it remains untenable to utilize a full set of product profiles in view of the related cognitive and time constraints.

For the sake of efficiency and convenience, a D-optimal fractional factorial design is required. The specific experimental design was created using the software package MODDE 9.0. Two uneven blocks of questions were created using D-optimal criteria, with the first block containing 15 choices and the second block 14. Once participants are randomly assigned to the blocks, a total of 1808 choice observations are attained as a result of 58 individuals completing the first block and 67 the second. Since the possibility of learning effects or fatigue is especially prevalent for surveys administered via computer (Savage and Waldman, 2008), the sequence of the tasks within each block are also randomly determined. In this manner, it is ensured as best as possible that there is sufficient product heterogeneity to evaluate individual preferences, keeping in mind the obvious challenge of streamlining the choice experiment procedure. Similarly, irrespective of what might be said about potential commercial viability, almost none of the possible product profiles were eliminated. For instance, in spite of representing an ‘inferior’ combination of attributes, a bundle of tomatoes produced in Mexico under neither organic nor fair conditions sold at a discounter for the highest price possible is included.<sup>10</sup>

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<sup>10</sup> However, the single exception is made for those products representing a combination of ‘independent organic retailer’ and ‘conventional’ to avoid unnecessary confusion. In fact, during pre-testing, frequent comments referred to this issue given the association between this retail format and the organic quality. It is therefore excluded.

## 4.4 Survey and data collection

### 4.4.1 Description of the German market

Before going into the specifics of the data collection process, it is helpful to describe why Germany provides a suitable context to explore sustainable consumption. First, Germany is the second-largest market in the world for both organic and fair trade products. Notably, organic food sales in Germany account for about 7€ billion, or 14% of the global market (Schaack et al., 2014). Meanwhile, demand for fair trade continues to grow strongly, with sales having increased by 23% from the previous year (2013) to now exceed 650€ million (Lindel, 2014). Furthermore, pertaining to our particular interest in tomatoes, its importance in Germany is only surpassed by the potato among vegetables consumed with an annual per capita consumption of 25 kilograms.<sup>11</sup> Accordingly, the diverse mix of tomatoes which are available makes this a suitable context for a choice experiment.

In view of the desire to understand how retail formats matter, Germany also provides a suitable context for exploration. At first glance, this market is most easily distinguished by the importance of ‘discounter’ formats. In fact, as a result of being home to four of the five leading discounters in the world, discounters are so important in Germany that this format is often described as the ‘German model’ of retailing (Wortmann, 2004). Partly owing to the prominence of discounters, there is also substantial concentration in the retail sector with the top five retailers controlling almost three-fourths of the market (Minhoff and Lehmann, 2015). In this regard, the German market is unique for the broad impact of discounters on the preferences of consumers (Adlwarth and Kecskeks, 2013). When asked to name their preferred food store(s), the most popular formats were either discounters or supermarkets (Finkbeiner and Karoff, 2014) – in fact, some of these formats were identified by one of every two people that were asked, while the majority of formats received a share between 25 and 33%. In contrast, organic retailers were identified by only 0.9% in the same survey.

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<sup>11</sup> The use of tomatoes is further supported by their importance for food production worldwide. Notably, tomatoes are one of the most widely produced vegetables at an estimated 161,794 million tons, or about 15% of total vegetable production (FAO, 2014). As indicated by its prominence in horticultural research, the status of the tomato is further demonstrated by the significant role for human health and nutrition.

#### 4.4.2 Sample description

This survey was administered via a computer-based survey format in November 2013 during an open-to-the-public event in a small city in eastern Germany. The participants in attendance were motivated by the desire to learn about what is being done at the research institutes in the city. Given that participants are generally self-motivated, such ‘Long Night of Sciences’-events thus provide a unique opportunity for conducting experiments. As best as possible, individuals were recruited randomly to participate, including through the use of posters inquiring: Have you already purchased your tomatoes today?

The survey begins with a brief introduction thanking participants for taking part and informing them of its general purpose and overall structure. In particular, it is mentioned that the survey is comprised of a short series of choice tasks relating to food provisioning that should last no longer than ten to fifteen minutes. The latter aspect is especially important owing to the nature of open-to-the-public events and the number of other activities available which also demand the time and attention of individuals. Concerning the discrete choice experiment, initial instructions are also provided to instill the proper frame. In specific, participants are asked to envision preparing to go shopping for themselves and/or their family. Among others, the purpose of their shopping includes tomatoes. Individuals are then asked to complete the choice tasks alone and to answer as accurately and spontaneously as possible. As a small token, individuals were rewarded for their participation with a salutary snack afterwards.<sup>12</sup>

**Table 4.2: Socio-demographic characteristics of the sample**

| Characteristic      |  | Values        |
|---------------------|--|---------------|
| Gender              | Male                                       | 37.90%        |
|                     | Female                                     | 62.10%        |
| Average age (years) |  | 32.73 (12.84) |
| Nationality         | German                                     | 94.35%        |
|                     | Others                                     | 5.65%         |
| Education           | High school degree or equivalent           | 79.84%        |
|                     | University degree or higher                | 50.00%        |
| Employment          | Unemployed (incl. students and homemakers) | 23.39%        |
|                     | Part-time and mini-job                     | 21.77%        |
|                     | Full-time                                  | 48.39%        |

<sup>12</sup> It was frequently noted afterwards that tomatoes should have been provided instead as a reward, the completion of the survey seeming to prime individuals with a taste for them.



|                            |                 |             |
|----------------------------|-----------------|-------------|
| Marital status             | Married         | 45.17%      |
|                            | Single          | 51.61%      |
| Average number of children |                 | 0.69 (1.04) |
| Average household size     |                 | 2.84 (1.56) |
| Income per month           | < 1,000€        | 27.42%      |
|                            | 1,000€ – 1,500€ | 12.10%      |
|                            | 1,500€ – 2,000€ | 14.52%      |
|                            | 2,000€ – 2,500€ | 11.29%      |
|                            | 2,500€ – 3,000€ | 12.90%      |
|                            | > 3,000€        | 21.77%      |
| Responsible for shopping   |                 | 84.68%      |

*Notes:* Sample size N = 124. Standard deviations are given in parentheses.

At the conclusion of the choice experiment, a socio-demographic questionnaire is included to better understand the life situations of participants (see Table 4.2). Given that individuals have to pay a small fee to attend, this questionnaire is also useful to consider the possibility of a self-selection bias. In total, our sample is composed of 125 participants. However, given that one participant failed to complete the socio-demographic questionnaire, our usable sample for the majority of characteristics actually includes 124 individuals.<sup>13</sup>

As can be seen in Table 4.2, women were more prevalent than men, representing 62% of the sample. Although practices in this domain are evolving rapidly, the tendency for women to be responsible for food provisioning makes this unsurprising. The fact that the majority of individuals (84.7%) identify themselves as being responsible for household shopping is more important for inferring that the answers provided are likely to reflect actual behavior. In this regard, since the experiment concentrates on consumer behavior, a minimum age of 18 was enacted with the survey set up to only record answers from participants that fit these criteria. In total, the average age of our sample is 33 years. Due to the prevalence of students in this city, this is neither unexpected nor necessarily unrepresentative. Similarly, nearly half of all individuals (48.4%) are employed full time, while another 23.4% are not employed. The latter included ‘professional’ students and stay-at-home parents. Since only two individuals describe themselves as currently retired, it can be concluded that the sample is dominated by individuals of working age or younger. The sample therefore provides the opportunity to explore the preferences of college-age individuals as well, a group that might be perceived to be less likely to engage in sustainable consumption given the lack of disposable income.

<sup>13</sup> The one exception is ‘number of children’ where the answer of one of the respondents was not included because of missing values.

The distribution of individual income turns out to be quite evenly distributed, though the tails of individuals making less than 1,000€ and more than 3,000€ each month are a bit thicker than suitable for a normal distribution. Befitting the context of the survey, the level of educational attainment is prominent, namely half of the sample possesses a university degree or is currently pursuing one and almost 80% have at least the equivalent of a high-school degree. This perhaps explains the low number of individuals with children in this sample. In fact, the most common answer to this question was zero by a wide margin, and the mean for the sample resides at only 0.69 children.

## 4.5 The mixed-logit model specification

Discrete choice experiments (DCEs) represent an application of the random utility theory (RUT) proposed by the psychologist Thurstone (1927) and extended by McFadden (1974). Furthermore, following the characteristics approach of Lancaster (1966), DCEs also rely on the central assumption that participants gain utility specifically from consuming the attributes which comprise the product under evaluation. Based on this theoretical framework, the utility that a decision maker  $n$  obtains from choosing alternative  $j$  in choice situation  $t$  can thus be represented in a discrete choice model in the following general form:

$$U_{njt} = v(A_{njt}, \beta) + \varepsilon_{njt}. \quad (1.1).$$

As shown in Equation 1.1, the level of utility ( $U_{njt}$ ) is decomposable into two additively separable parts: a systematic (explainable) component  $v(A_{njt}, \beta)$  which is a function of the observable attributes of the alternatives, the socio-economic characteristics of the respondent and the features of the decision context and the choice task itself; and a random component  $\varepsilon_{nj}$  which is an error term reflecting unmeasured preference heterogeneity (Louviere et al., 2000). Generally speaking, it is assumed that participant  $n$  will choose alternative  $j$  if and only if that alternative is seen to maximize his or her utility for all  $J$  alternatives that are considered in the specific choice situation  $t$ . Accordingly, the probability ( $P_{nit}$ ) of choosing alternative  $i$  over  $j$  is equal to the probability expressed in equation (1.2):

$$\begin{aligned}
P_{nit} &= \text{Prob}(U_{ni} > U_{nj}) \forall j \neq i \in t \\
&\text{Prob}(v_{ni} + \varepsilon_{ni} > v_{nj} + \varepsilon_{nj}) \forall j \neq i \in t \\
&\text{Prob}(\varepsilon_{nj} - \varepsilon_{ni} < v_{ni} - v_{nj}) \forall j \neq i \in t.
\end{aligned} \tag{1.2}$$

Concerning the random components which are involved, it is possible to obtain different discrete choice models by varying the assumptions which establish how such terms are distributed. In this chapter, it is assumed that the coefficients in the model vary across individuals. For this reason, a mixed-logit model specification is applied to analyze the results (Greene and Hensher, 2003). By ignoring the subscript  $t$ , the principal equation for the probability of choosing alternative  $i$  over  $j$  in a mixed-logit setting can be expressed as follows:

$$P_{ni} = \int \frac{\exp(x'_{ni} \beta)}{\sum_{j=1}^J \exp(x'_{nj} \beta)} f(\beta | \theta) d\beta \tag{1.3},$$

where  $f(\beta | \theta)$  is the density function of  $\beta$  and different substitution patterns between the alternatives can be obtained from an appropriate specification of  $f(\beta | \theta)$ .

When several choices of an individual are taken into account, moreover, the probability of a particular sequence of choices then becomes:

$$S_n = \int \prod_{t=1}^T \prod_{j=1}^J \left[ \frac{\exp(x'_{njt} \beta)}{\sum_{j=1}^J \exp(x'_{njt} \beta)} \right]^{y_{njt}} f(\beta | \theta) d\beta \tag{1.4},$$

where  $y_{njt}$  is equal to one if the alternative  $j$  is chosen in choice situation  $t$ , and zero otherwise. Furthermore, Train (2003) points out that the log likelihood for this model, i.e.:

$$LL(\theta) = \sum_{n=1}^N \ln S_n \tag{1.5},$$

cannot be solved analytically. As a result, the  $\theta$  parameters can only be estimated by maximizing the simulated log-likelihood function of the following form:

$$SLL = \sum_{n=1}^N \ln \left\{ \frac{1}{R} \sum_{r=1}^R S_n(\beta^r) \right\} \quad (1.6),$$

where  $R$  is the number of replications and  $\beta^r$  is the  $r^{th}$  draw from  $f(\beta | \theta)$  (Hole, 2007). Using Equation (1.6), the coefficient estimates for all relevant attributes,  $\beta_k$ , can be obtained. This is also the case for the coefficient for the cost attribute,  $\beta_c$ . As a result, the willingness to pay for an improvement in attribute  $k$ , i.e.  $WTP_k$ , is expressed as the negative ratio of the coefficients of this attribute,  $\beta_k$ , and the cost attribute,  $\beta_c$ :

$$WTP_k = -\frac{\beta_k}{\beta_c} \quad (1.7).$$

Following the approach of Bech and Gyrd-Hansen (2005), a slight modification in the following manner is necessary in order to derive WTP for effects-coded attributes:

$$WTP_k = -2 \frac{\beta_k}{\beta_c} \quad (1.8),$$

where  $k$  is an effects-coded attribute and  $WTP_k$  represents the marginal WTP for attribute  $k$ .

## 4.6 Presenting and discussing the results of the discrete choice experiment

### 4.6.1 Establishing the status quo

The overall results for the individually-specified status quo can be seen in Table 4.3. In order to provide context for the results, they are shortly compared with actual consumption in the German market. Generally speaking, these results demonstrate the value of having a status quo that is able to reflect the diverse situations of consumers.

**Table 4.3: Results for the individually-specified status quo**

| Attribute          | Attribute levels | Distribution |
|--------------------|------------------|--------------|
| Price per 500g     | 1.50 €           | 60.0%        |
|                    | 2.50 €           | 40.0%        |
| Country of origin  | Local            | 61.6%        |
|                    | Mexico           | 0.0%         |
|                    | Spain            | 38.4%        |
| Retail format      | Organic retailer | 12.0%        |
|                    | Discounter       | 20.8%        |
|                    | Supermarket      | 67.2%        |
| Organic production | Organic          | 36.0%        |
|                    | Conventional     | 64.0%        |
| Ethical standards  | Fair             | 50.4%        |
|                    | Not fair         | 49.6%        |

Notes: Sample size N = 124.

Regarding price, the sample is split rather evenly between the two options, though the majority of participants do lean towards the price of 1.50€. Importantly, however, this result illustrates that a substantial number of individuals seem to be willing to pay more for their tomatoes. In this vein, it can also be noted that 36% of individuals claim to regularly purchase organic tomatoes, while more than half characterized their typical tomato as produced according to ethical standards. Both results are somewhat surprising given that, in the first case, the market share of organic fruits and vegetables in Germany is around 4% and, in the second, the use of fair trade claims in the manner here described still remains relatively uncommon. Nonetheless, there are many individuals who believe their tomatoes to be ‘fairly’ produced, perhaps reflecting the novelty of this attribute and/or the potential tendency to utilize associations with local production as the basis for this statement.<sup>14</sup> Taken with the results for organic production, it could also be that individuals simply wish to appear more ethical and environmentally conscious than they actually are. The existence of such a social desirability bias is in fact well-established in the sustainable consumption literature (Costanigro et al., 2011; Fisher, 1993; Lusk and Norwood, 2009). In specific, Lusk and Norwood (2009) contend that individuals gain satisfaction from the simple act of presenting themselves in a certain manner when they claim to be willing to purchase an ethical product.

<sup>14</sup> There is however recent anecdotal evidence that would seem to undermine the expectation that more local production is inherently better in terms of treatment of workers (Reiser-Fischer, 2014).

Since product origin might also be seen to convey information about those who purchase certain products, it is possible that a similar situation could have emerged when participants were asked to describe where their typical tomato comes from. In our sample, almost 40% of participants acknowledged Spain to be most reflective of the origin of their tomatoes. In the context of this experiment it is necessary to recall that Spain is representative of tomato-exporting countries in the European Union. Mexico, on the other hand, stands in for other tomato-producing countries around the world. It is rather surprising that no individual used this option to describe their typical tomato, whereas more than 60% did select local production.<sup>15</sup> Similar to organic and ethical production, this result is greeted with some suspicion given that Germany is one of the top three importers of fresh tomatoes in the world (FAO, 2001) and local and regional production is generally restricted to spring and summer months. The number of participants signaling a status quo of local production therefore seems to reflect either a fundamental lack of awareness of where their food comes from or another instance of self-presentation. Conversely, it could be suggested that participants, upon finding the country of origin of their typical tomatoes not listed – whether it be Italy, Netherlands, or Morocco – might then opt for the highest quality attribute to approximate the perceived level of quality to which they are accustomed.

In contrast, the description of the status quo for the retail format attribute appears substantially more plausible. First, the type of retail format most commonly utilized to purchase tomatoes is shown to be the supermarket, with this option selected by more than two-thirds of all participants. Nonetheless, the discounter format still accounts for approximately 20% of the sample, and the other 12% of participants identified the organic retailer as their typical format. It is thus apparent that each of the formats is well-represented when it comes to (sustainable) tomato consumption. In addition, the higher-than-expected share of organic retailers is interesting given the established link between purchasing local and organic products and shopping at such formats (e.g. Bond et al., 2008a; Yue and Tong, 2009). Moreover, in contrast to the dominance of large discounters and supermarkets in the wider German food market, the status quo results reflect that the provisioning of tomatoes is more likely to occur across a range of formats. Though perhaps explained in terms of social desirability bias, this result could also reflect the greater importance of trust when purchasing fresh produce.

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<sup>15</sup> Troubling in this regard, one participant commented during the exit interview that they were not aware of whether Mexico actually produced tomatoes. Again, this might reflect either a lack of awareness with the country of origin or possibly a desire to limit the acknowledgment of this fact when purchasing tomatoes of ‘less desirable’ origin.

Notably, when Germans were asked to specify which retail format was most trustworthy, the answers differed markedly relative from when they were asked to name their preferred format (e.g. Finkbeiner and Karoff, 2014). In specific, it was small neighborhood shops (41%) and local markets (24%) which were then identified most frequently, while the share for supermarkets (19%) decreased significantly (GS1, 2006). In fact, the supermarket share in the other four countries included in the survey was never below 50%. What is more, the German share for small neighborhood shops is almost two times larger than that for any other country, indicating the level of confidence in such formats. As a final point, the greater representation of smaller retailers also reflects the generally sizable share of alternative formats when it comes to sustainable consumption in Germany (FAO, 2001).<sup>16</sup>

In relation to the status quo, some preliminary insight into the performance of the discrete choice experiment can be gathered from the number of individuals who never diverged from this option. Notably, though some bias in this direction is expected, the repeated selection of only the status quo is potentially indicative of a flaw in the experimental design – namely the choice tasks proved too complex, the potential alternatives were unclear, or respondent fatigue and general lack of motivation (Adamowicz et al., 1998; Hoyos, 2010). However, since only seven individuals never traded off from the status quo, the experiment seemed to perform well in this respect. For similar reasons, it is important to look at how many people decided to use the ‘opt out’ option and not purchase a tomato as well. In fact, nearly 14% of participants made use of this option, resulting in a total of 33 choices of this kind. Since this represents almost 2% of all observations, it seems that individuals felt comfortable using this option when not wanting to register a choice. Further, from a detailed look at individual responses, it is established that instances of opting-out are fairly well-distributed across the choice tasks and are not clustered for any one specific alternative or choice task.<sup>17</sup> In sum, the results suggest that participants generally preferred the status quo they designed but were still willing to trade-off for sufficiently desirable alternatives.

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<sup>16</sup> Though the organic sector has changed and continues to change substantially over the years, it is notable that the most common channels for selling organic fruit and vegetables in Germany were: natural food stores of the type considered in this study (35%); supermarkets (24%); and farmers’ markets and direct-to-consumer sales (20%).

<sup>17</sup> There is a slight tendency to opt out more often in choice tasks involving less desirable options, i.e. tomatoes sold at a high price but composed of a ‘cheap’ combination of attributes. Given that this points to participant confusion as a potential issue, our decision to exclude the pair of ‘conventional’ and ‘organic retailer’ is reinforced.

## 4.6.2 Estimation results

### 4.6.2.1 Information criteria and coding strategy

A mixed-logit model with two way-interactions between the attributes is used to estimate the results of the discrete choice experiment. This specification is determined to represent the best option for exploring existing preference heterogeneity in the sample for a number of reasons. First, the fact that all random effects are found to be strongly significant confirms that this model is able to capture the individual variation in each attribute better than corresponding multinomial logit and fixed-effects logit specifications.<sup>18</sup> Random effects are therefore included for all attributes except for price, which must be specified as a fixed attribute in order to attain estimates of willingness to pay (WTP) with a normal distribution: Since WTP is the ratio of two coefficient estimates, allowing price to vary makes it difficult to evaluate, given that its distribution would then actually be the ratio of two distinct distributions. In contrast, if price is fixed, WTP is then distributed in the same fashion as the coefficient of the attribute in question (Train, 2003). Further, the selection of this model is generally supported by information criteria.<sup>19</sup> According to the Bayesian Information Criterion (BIC), the mixed-logit model with two-way interactions and interactions with socio-demographic characteristics (BIC = 1592.89) is found to provide a superior fit of the data compared to both the mixed-logit model with two-way interactions (BIC = 1599.25) and the straightforward mixed-logit model (BIC = 1682.13).<sup>20</sup> Coefficient estimates and information criteria for the selected model are reported in Table 4.4.

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<sup>18</sup> The significance of the random effects can be observed by looking at the standard deviation (*SD*) rows for each variable. In brief, if the random effect is significant, it is the case that there is substantial heterogeneity within the sample for this variable, which makes it inappropriate to exclusively rely on a sample-wide estimation of the effect.

<sup>19</sup> Moreover, and with few exceptions, the results are generally robust to changes in model specification. A number of other specifications were tested, along with different approaches for coding the socio-demographic variables with little change to the results. Further information is available from the authors.

<sup>20</sup> An elaboration of the information criteria can be found in the Appendix of this chapter. A more detailed overview is also provided in Table A.1.



**Table 4.4: Results of the mixed-logit model with two-way and socio-demographic interactions**

| Attribute                             | Parameter estimate   | SE    | p-value | CI (95%)    |             |
|---------------------------------------|----------------------|-------|---------|-------------|-------------|
|                                       |                      |       |         | Lower limit | Upper limit |
| <b>Main effects</b>                   |                      |       |         |             |             |
| Local <sup>1</sup>                    |                      |       |         |             |             |
| Mean                                  | 1.64 <sup>***</sup>  | 0.579 | .005    | 0.51        | 2.78        |
| SD                                    | 1.86 <sup>***</sup>  | 0.285 | .000    | 2.32        | 2.42        |
| Mexico <sup>1</sup>                   |                      |       |         |             |             |
| Mean                                  | -2.27 <sup>***</sup> | 0.464 | .000    | -3.18       | -1.36       |
| SD                                    | 0.80 <sup>***</sup>  | 0.303 | .008    | 0.21        | 1.40        |
| Organic Retailer <sup>1</sup>         |                      |       |         |             |             |
| Mean                                  | -0.63                | 0.412 | .130    | -1.43       | 0.18        |
| SD                                    | 0.92 <sup>***</sup>  | 0.201 | .000    | 0.53        | 1.32        |
| Discounter <sup>1</sup>               |                      |       |         |             |             |
| Mean                                  | -1.68 <sup>**</sup>  | 0.714 | .019    | -3.07       | -0.28       |
| SD                                    | 0.94 <sup>***</sup>  | 0.211 | .000    | 0.53        | 1.35        |
| Organic <sup>1</sup>                  |                      |       |         |             |             |
| Mean                                  | 2.03 <sup>***</sup>  | 0.727 | .005    | 0.61        | 3.45        |
| SD                                    | 1.96 <sup>***</sup>  | 0.296 | .000    | 1.38        | 2.54        |
| Fair <sup>1</sup>                     |                      |       |         |             |             |
| Mean                                  | 3.74 <sup>***</sup>  | 0.634 | .000    | 2.50        | 3.45        |
| SD                                    | 1.56 <sup>***</sup>  | 0.251 | .000    | 1.07        | 2.06        |
| Price (fixed)                         | -3.60 <sup>***</sup> | 0.359 | .000    | -4.31       | -2.90       |
| <b>Attribute interactions</b>         |                      |       |         |             |             |
| Local x Organic Retailer              | 1.37 <sup>*</sup>    | 0.719 | .057    | -0.04       | 2.77        |
| Local x Discounter                    | 0.42                 | 0.494 | .392    | -0.55       | 1.39        |
| Local x Organic                       | -0.36                | 0.702 | .605    | -1.74       | 1.01        |
| Local x Fair                          | -0.03                | 0.566 | .956    | -1.14       | 1.08        |
| Mexico x Organic Retailer             | 3.04 <sup>***</sup>  | 0.730 | .000    | 1.61        | 4.47        |
| Mexico x Discounter                   | 1.27 <sup>**</sup>   | 0.587 | .030    | 0.12        | 2.42        |
| Mexico x Organic                      | -0.30                | 0.721 | .674    | -1.72       | 1.11        |
| Mexico x Fair                         | 0.11                 | 0.662 | .874    | -1.19       | 1.40        |
| Discounter x Organic                  | -0.84 <sup>*</sup>   | 0.504 | .093    | -1.83       | 0.14        |
| Discounter x Fair                     | -0.17                | 0.514 | .746    | -1.17       | 0.84        |
| Organic Retailer x Fair               | -0.31                | 0.661 | .635    | -1.61       | 0.98        |
| Organic x Fair                        | -1.07 <sup>***</sup> | 0.612 | .001    | -2.26       | 0.13        |
| <b>Socio-demographic interactions</b> |                      |       |         |             |             |
| Local x Marital Status                | 0.49                 | .563  | .382    | -0.61       | 1.60        |
| Local x Children                      | 0.40 <sup>*</sup>    | .242  | .100    | -0.08       | 0.87        |
| Local x Shopping Resp.                | 0.69                 | .485  | .156    | -0.26       | 1.64        |
| Local x Age                           | 0.36                 | .551  | .518    | -0.72       | 1.43        |
| Discounter x Gender                   | -0.48 <sup>*</sup>   | .284  | .089    | -1.04       | 0.07        |
| Discounter x Citizenship              | 1.66 <sup>***</sup>  | .631  | .008    | 0.43        | 2.90        |
| Organic x Education                   | 0.38                 | .535  | .475    | -0.67       | 1.43        |
| Organic x Employment                  | -0.80 <sup>*</sup>   | .450  | .076    | -1.68       | 0.08        |
| Fair x Household Size                 | -0.26 <sup>***</sup> | .089  | .003    | -0.44       | -0.09       |
| Price x Gender                        | 0.86 <sup>***</sup>  | .262  | .001    | 0.34        | 1.37        |

|                        |       |      |      |       |      |
|------------------------|-------|------|------|-------|------|
| Price x Marital Status | -0.16 | .347 | .645 | -0.84 | 0.52 |
| Price x Children       | 0.17  | .161 | .293 | -0.15 | 0.48 |
| Price x Employment     | 0.34  | .342 | .332 | -0.33 | 1.01 |
| Price x Age            | 0.28  | .412 | .491 | -0.52 | 1.09 |

<sup>1</sup>Effects-coded variables.

Notes: \* $p < .10$ , \*\* $p < .05$ , \*\*\* $p < .01$ ; SE = standard error; CI = confidence interval; SD = standard deviation; sample size N = 123; number of observations = 5334; log-likelihood = -697.80; BIC = 1592.89.

Before discussing the results, it is necessary to first describe some other features of the model. First, it can be noted that a constant term is not included. Though the addition of such a term is generally advisable for discrete choice analysis,<sup>21</sup> the decision was taken to remove the constant from the model since it became insignificant as more random effects were included. Second, a coding strategy is needed to interpret the results due to the existence of categorical data. Effects coding is applied for many reasons, though principal among them is the more straightforward interpretation of the categorical independent variables. Notably, effects coding, unlike dummy coding, is able to provide an unbiased estimate of the main effects even when interactions are included (Hoyos, 2010).<sup>22</sup> Since this chapter desires to provide willingness to pay estimates and explore the interactions between sustainable quality claims, effects coding therefore represents an appropriate approach. This strategy, however, has a significant impact on how the results are interpreted, especially for the categories of retail format and origin. It can be noted from Table 4.4 that only two of the three attribute levels are included for both retail format and origin since the level not listed for each attribute – i.e. supermarket for retail format and Spain for origin – is set as the reference.<sup>23</sup> As a result, the two variables for origin are coded to consider how the impact of the two alternatives, i.e. Local and Mexico, differs from that of Spain, while the two for retail formats are similarly coded to explore whether the influence of the alternatives of the discounter and organic retailer, respectively, differs from that of the supermarket. In each case, the comparison of the alternatives to the baseline thus allows us to establish if selecting the

<sup>21</sup> In particular, Hoyos (2010) highlights the potential for biased parameter estimates when the constant (or ASC) is excluded. Furthermore, it is argued that this term has possible interpretative value as either a status quo bias or endowment effect (e.g. Adamowicz et al., 1998). In addition to the constant term being insignificant in our case, both concerns are less of an issue anyway since the use of effects coding limits correlation with the intercepts.

<sup>22</sup> Due to effects coding, attributes are assigned a value of 1 when the description is applicable, a value of -1 when the base category fits, and 0 otherwise. This is in notable contrast to the use of 1 for the attributes and 0 otherwise that is typical for dummy coding.

<sup>23</sup> As might be expected, these two levels are chosen as the baseline because of their correspondence to what is most typical in this market.

alternative significantly impacts the likelihood to purchase. As such, the relevant coefficient estimates and resulting WTP estimates do not indicate, for example, the value of local production on its own but rather if there is a significant difference between how individuals value local production and Spanish production of tomatoes.

#### *4.6.2.2 Fixed effects*

Looking at the fixed effects, it is notable that six of the seven variables are significant at an  $\alpha$ -level of  $p < .01$ , and with the coefficient estimates having the expected signs. In general, this demonstrates the importance of all these features when making consumption decisions. Since the ability to derive willingness-to-pay estimates depends on the price attribute being significant and negative, it is meaningful that this attribute is robustly negative with  $p = .00$  in the model. As such, it is established that increases in price lead to substantial decreases in the likelihood of purchasing tomatoes. Since the fixed effects for most variables are significant and with the expected sign, there is not much to be said beyond the fact that the results are broadly in line with the literature. In this regard, it can be confirmed that quality claims related to organic production and ethical standards have a positive impact on purchasing decisions. In addition, the fact that the coefficient of local production is significant ( $p < .01$ ) indicates that this variable has an additional impact on the likelihood of purchasing tomatoes above and beyond the value of being produced in Spain. In contrast, the opposite can be said for Mexico, which has a depressing effect on product value. In sum, it is demonstrated that there is substantial importance assigned to the various expressions of sustainable production. Further, given that one origin improves overall value and another decreases it substantially, substantial differences exist in terms of how participants evaluated where tomatoes are produced. Since the coefficients cannot be interpreted in any straightforward sense, however, we hold off on a lengthier discussion until the WTP estimates are derived.

Concerning retail formats, there is one significant finding as well as one significant non-finding – the latter being that there is no difference between organic retailers and supermarkets in terms of impact on the purchasing decision. Accordingly, the results suggest that a tomato sold at an organic retailer is not seen as more desirable than one sold at a supermarket. In contrast, products sold at discounters are found to be evaluated differently: In particular, the decision to purchase a tomato is sharply reduced when it is sold in such a format. Since the

other two formats are not found to be significantly different from one another, it can be concluded that the discounter format is perceived to be generally inferior. If we consider what it means for the fixed effect of a particular retail format to be significant, it becomes clear how strong a result this is. Notably, since the fixed effect for discounter is found to be negative, it can be concluded that – no matter the combination of attributes considered – individuals are less willing to buy tomatoes which are sold at discounters. Generally speaking, this seems to reflect a negative evaluation of fresh produce sold in such formats, irrespective of the presence of organic and fair trade labels.

#### 4.6.2.3 Interaction effects

Since the foregoing only examines the results for fixed effects, it cannot be concluded that there is no difference between supermarkets and organic retailers – but rather that there is no difference between the two for all potential attribute combinations which might be considered. Accordingly, concerning the results for the interaction effects, it is noteworthy that four of the five significant interactions involve retail formats.<sup>24</sup> With regard to the discounter format, its positive interaction with Mexico (*Mexico x Discounter*) shows that tomatoes originating outside of the European Union are valued more highly when sold at discounters, i.e. instead of supermarkets. Given that this interaction reflects the pairing of the ‘lowest’ level of retail format with the ‘lowest’ level of origin, it seems that the credibility issues that discounters face when it comes to high-quality products are no longer present for qualities that are less desirable. Instead, perhaps owing to a perceived association with low quality, the negative impact of being sold at a discounter disappears for such products. Expressing the importance of credibility in another manner, the negative interaction of discounters with organic production (*Discounter x Organic*) reveals that the value of organic production is contingent on the format involved. In contrast to suggestions that quality labels have an intrinsic value not related to the venue where such products are sold, it is thus established that the perceptions of credence qualities such as country of origin and organic production is heavily dependent on the type of retail format. Moreover, since the fixed effect for the discounter format is also negative, this interaction suggests that the impact of discounters vis-à-vis supermarkets is more negative

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<sup>24</sup> Again, all potential interactions between attributes are considered with the exception of the interaction between ‘conventional’ and ‘organic retailer’ which is excluded to avoid confusion on the part of participants.

when evaluating the presence of organic production than is the case for the other attributes.

At this point, it is important to delve into why exactly the perception of product quality might vary by retail format. After all, given that certification systems are said to provide the necessary quality-related information to consumers, the tasks of retailers and retail formats would appear limited to stocking and selling products whose level of quality has already been established and designated by the presence of fair trade and organic labels. In actual practice however, this view of the supply chain goes out the window if the information provided by certification systems is shown to be unreliable. The extent of fraudulent claims in organic certification in the European Union generally (Giannakas, 2002) – and Germany specifically (Baumann, 2001) – therefore demonstrates that labels alone provide an unsteady foundation for inferring product quality. Similarly, the existence of a substantial disconnect between consumer expectations and the lived experiences of farmers in the case of fair trade further underscores the potential shortcomings of relying on certification systems (Getz and Shreck, 2006; Griffiths, 2012). In fact, reflecting how individuals are ultimately at the mercy of audit systems, process-related attributes such as animal welfare, fair trade, and dolphin-safe tuna have recently been referred to as ‘Potemkin attributes’. This type of attribute is specifically distinguished by the fact that “neither the buyer nor external institutions are able to carry out controls through laboratory analyses at the end-product level” (Jahn et al., 2005: 55). There is therefore an intractable limit when it comes to the ability of consumers to determine the level of quality present. Consequently, individuals are willing to pay a premium for verification information which comes from a source that is perceived to be more credible (Olynk et al., 2010a, 2010b). Finally, tying into the discussion of conventional and organic production systems, the importance of supply chain considerations is further reinforced by the potential heterogeneity within organic systems. Notably, although organic systems are generally associated with quality improvements, the existence (or not) of crucial ingredients such as farmer expertise are able to explain why “variation within organic and conventional farming systems is likely as large as the differences between the two systems” (Knoblauch et al., 1990: 3; see also Bourn and Prescott, 2002; Gravel et al., 2010; Lairon and Huber, 2014; Pieper and Barrett, 2008).<sup>25</sup> Irrespective of whether the same certification

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<sup>25</sup> The diverse impact of this expertise is specifically described in relation to the selection of suitable cultivars with a high nutrient-use efficiency, providing the additional time needed for organic tomatoes to mature, proper use and application of nitrogen fertilizers, and use of aerobic composting to improve hygienic quality of organic fertilizers.

standard is used, the potential heterogeneity within a specific type of system further elucidates why supply chain considerations are relevant for quality evaluation.

Besides underscoring the insufficient level of credibility offered by the label alone, the relevance of supply chain considerations makes it possible to describe the more essential role of retailers. Notably, given that retailers have taken a supervisory role over the wider supply chain (e.g. Busch and Bain, 2004), the specific link of the retail format is more relevant than most for quality assurance. However, having only focused on discounters so far, the relevance of retail formats has generally been portrayed in a negative light. Notably, given what has been established about discounters, it might be suggested that an organic product sold in this format is evaluated more poorly on account of its connection to a supply chain where quality assurance is less emphasized. In contrast, if the example of organic retailers is considered, it is possible to explore how quality evaluation might also be positively impacted. In this regard, the positive interaction apparent in the results between organic retailers and Mexico (*Mexico x Organic Retailer*), while surprising at first sight, seems to indicate that tomatoes from a 'less desirable' origin are more valuable when purchased at an organic retailer. Somewhat paradoxically, it can be inferred from this interaction that either something about organic retailers makes such products more desirable or, conversely, that this attribute pairing is so incongruous with expectations that individuals became confused and chose to give such retailers the benefit of the doubt. The result may thus demonstrate the impact of the greater perceived trustworthiness of more small-scale and independent formats in the context of Germany (e.g. GS1, 2006).

As another possibility, since this interaction is evident for both discounters and organic retailers, it could illustrate how tomatoes from Spain are viewed in supermarkets. Owing to their role as the reference levels, any underlying interaction between these two attributes might be diversely expressed in the various interaction effects which are shown in Table 4.4 and have already been described. As such, it is possible that there is an implicit association between supermarkets and tomatoes from EU-countries such as Spain which is not present for the other formats. On the one hand, this explanation is intuitively appealing given the unlikelihood that the same mechanism is producing the interaction effects for both organic retailers and discounters. On the other, it could be that two separate mechanisms are actually providing tomatoes from Mexico with increased desirability when not sold within the confines of a supermarket. For example,

maybe Mexican tomatoes are viewed differently in discounters since the pairing largely conforms to expectations, e.g. similar to the suggested association between Spain and supermarket. In this vein, it might be proposed that the quintessential ‘discounter tomato’ comes from somewhere like Mexico just as a quintessential ‘supermarket tomato’ comes from a nation such as Spain. Meanwhile, the increase in the perceived quality of Mexican tomatoes which are procured from organic retailers alludes to the greater demands on quality assurance for products coming from further away. Hence, in cases where information about production conditions is limited given the distance involved, the greater trustworthiness of organic retailers is seen, according to our results, to potentially compensate for the negative impact that Mexican production typically has on quality evaluation.

Of course, in order to establish the likelihood that two distinct mechanisms exist, it is necessary to consider questions such as what the quintessential ‘organic retailer tomato’ might be, and why a strong connection between origin and retail format exists. Concerning the first point, it is relevant that being sold at an organic retailer has a positive influence on the attribute ‘local’ as well. Notably, of all the interactions with local production that are examined, only the one with organic retailers (*Local x Organic Retailer*) is significant. As a result, it can be suggested that the quintessential ‘organic retailer tomato’ is locally produced. Reflecting the higher prominence of alternative retail formats for purchasing sustainable food (Keeling-Bond et al., 2006; Onozaka et al., 2011; Yue and Tong, 2009), there also appears to be a perceived association between the demand for local production and the use of shorter supply chains. Moreover, it can be observed from our results that a tomato offered by this type of retail format is more generally desirable, no matter whether produced locally or in a faraway country. Accordingly, whereas discounters are shown to negatively influence the overall likelihood of consumption, the impact of organic retailers occurs somewhat more subtly through its interaction with quality claims. As expressed by its significant interaction with two distinct sources of production (*Local x Organic Retailer*, and *Mexico x Organic Retailer*), this type of retail format seems especially important for providing quality assurance to consumers. In this vein, we are able to better describe why such formats are relevant for the quality perception and price sensitivity of individuals (Hsieh and Stiegert, 2012; Umberger et al., 2009), namely by their providing greater assurance that claims are supported by actual quality. Given that the perceived trustworthiness of retail formats is a critical determinant of the credibility of their quality claims, the full measure of why retail formats matter cannot be captured without considering interaction effects. In this respect, it should be recalled that the fixed effect for organic retailers is the only

one found to be insignificant in the estimation results (see Table 4.4). For this reason, it is necessary to explore both the direct impact of the type of retail format and its interactions with the other attributes to explain its influence on sustainable consumption.

Before considering the further implications that can be drawn from the interaction between local production and organic retail formats, it bears repeating that this study finds three different types of sustainable qualities which positively influence the value of tomatoes: organic production; ethical standards (or fair production); and local origin. However, there is only one interaction between the different quality claims which is found to be significant: the one between organic and fair production (*Organic x Fair*). In fact, this interaction is the only one which does not involve a retail format. Moreover, since it is negative, it is not only concluded that the effects of the two types of quality claims are not independent of each other, but also that a non-additive relationship is present between the two (cf. Onozaka and Thilmany McFadden, 2011). As such, the simultaneous presence of both qualities seems to have a cumulative impact which is less than what is suggested by the sum of their separate values – further consideration of this interaction is reserved for the next section on willingness-to-pay estimates. For the present discussion, it is more noteworthy that local production is not significantly influenced by any other type of sustainable quality claim. In part, this can be explained by the fact that this attribute is often linked with ‘food miles’ and the polluting impact of transporting food across large distances (e.g. Onozaka and Thilmany McFadden, 2011). If it is the impact on the environment that is relevant, local production can be seen to represent a distinct attribute within the set of sustainable claims.

Conversely, once the problems of fraud and quality uncertainty are considered, the interaction of local production with organic retailers suggests the potential for a partnership to develop a deeper connection to where food is produced. In this regard, it is relevant that the least desirable tomatoes, i.e. those chosen by the fewest number of participants, had in common that they were neither sold at an organic retailer nor were locally produced.<sup>26</sup> Concerning quality assurance, there is in fact anecdotal evidence that the opportunity to directly interact with producers, for instance in the context of farmers’ markets, diminishes the need for consumers to rely on and, as a result, the significance of third-party certifications (Thilmany et al., 2008: 1305). Similarly, it is noted that individuals who buy

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<sup>26</sup> Further information about the breakdown of the choice tasks is available from the author upon request.



apples directly from farmers seem less concerned about whether or not a product is organic since “interactions with producers serve as direct assurances for the effectiveness of their purchase decisions associated with positive outcomes from organic production methods” (Onozaka et al., 2011: 586). Accordingly, the lack of interaction between organic and local production and between organic and fair trade, respectively, suggests that each attribute exercises a separate effect on product quality. On the one hand, there are those more ‘distant’ mechanisms for communicating quality such as organic and fair trade labels. On the other, there are more ‘proximate’ mechanisms like local production and being purchased from an organic retailer which appear to work in combination to provide a higher level of quality assurance than is the case for either of them alone. Drawing on extensive sociological research illustrating the broader impact of the felt connection to the people and places involved in food production (Goodman and Goodman, 2001; Guthman, 2002; Watts et al., 2005), it can thus be surmised that the interaction between organic retailers and local production is seen to be beneficial for exactly this reason. Notably, this interaction – beyond the broader correspondence of both attributes with shorter supply chains – suggests the potential to communicate and establish a deeper connection of consumers to where food production takes place.

#### 4.6.3 Estimates of willingness to pay

The willingness-to-pay (WTP) estimates derived from the discrete choice experiment are presented in Table 4.5. Since it is not possible to draw conclusions about the size of the effects directly from the coefficient estimates, WTP estimates can provide crucial insight into the value associated with the different attributes. Two aspects of the estimation approach must be noted before looking at the results themselves. First, due to the use of effects coding, the ratio of the quality attribute to the price attribute must be multiplied by two to attain accurate WTP estimates (Bech and Gyrd-Hansen, 2005; Lusk et al., 2003). Second, the WTP estimates only reflect the impact of the main effects, that is, in the absence of any interactions. In other words, these estimates reveal the independent value of a given quality after the influence of the other qualities has been filtered out. Hence, such estimates are helpful to establish the base value of the qualities that are relevant for sustainable consumption. However, it must be noted that due to the existence of preference heterogeneity in the sample, the mean WTP estimates

reflect the hypothetical average for the sample and are not representative for each individual in the sample.

**Table 4.5: WTP estimates**

|                 | Local | Mexico | Organic retailer | Discounter | Organic | Fair |
|-----------------|-------|--------|------------------|------------|---------|------|
| WTP/WTA         | 0.91  | -1.26  | -0.35            | -0.93      | 1.13    | 2.08 |
| ll <sup>1</sup> | 0.29  | -1.77  | -0.79            | -1.72      | 0.37    | 1.45 |
| ul <sup>1</sup> | 1.53  | -0.75  | 0.09             | -0.15      | 1.89    | 2.71 |

<sup>1</sup>Lower/upper limit of the 95% confidence interval.

Notes: Sample size N = 124; WTP = willingness to pay; WTA = willingness to accept.

Turning to the mean WTP estimates, the first thing that stands out is how strongly almost all the attributes appear to factor into individual decision-making. With the exceptional case of organic retailers already described in Section 4.6.2.2, it is established that individuals are willing to pay a significant premium for sustainable attributes such as organic, fair trade, and local production. What is more, participants are found to be willing to purchase tomatoes from discounters or which originate in less familiar countries like Mexico only when sold at a lower price. Besides illustrating the potential market for such qualities, the results also facilitate comparison with the existing literature. The existence of a premium for the various features of sustainable production is in broad agreement with previous studies (e.g. Hu et al., 2009; Meas et al., 2014; Onozaka et al., 2011). However, the WTP estimates derived from this experiment – notably 1.13€ for organic production and 2.08€ for ethical standards – are larger than those typically found. In comparison, Yue and Tong (2009) establish a WTP of \$0.67 for a pound of organic tomatoes, after correcting for hypothetical bias. While it might be suggested that our estimate is thus somewhat dubious, it is relevant that other studies do not find any premium for organic and fair trade tomatoes (e.g. Onozaka and Thilmany McFadden, 2011). In addition, this same study determines that fair trade labels are relevant for the average consumer only when coupled with specific places of origin.

Nevertheless, the problem with deriving implications from this result, and from relying on mean WTP estimates more generally, is the limited amount that can be learned from the preferences of average consumers. Notably, if there is preference heterogeneity between the participants (which is the case whenever the random effects are significant), then the mean WTP estimates cannot be interpreted as representative for the entire sample. Instead, this estimate reflects the WTP of the

hypothetical ‘average’ in the sample, which may or may not be relevant for actual consumption. As a response to the substantial heterogeneity in individual preferences, one strategy is to divide the sample into smaller clusters. Notably, though the WTP for fair-trade coffee is 0.19€ for the sample as a whole, De Pelsmacker et al. (2005) find this estimate to vary between 0.06€ and 0.62€ for the various clusters. Due to the likely disparity between the mean estimate of WTP and those of the distinct clusters, there is the possibility for divergent conclusions to be provided with regards to the viability of a particular market.

In spite of the potential limitations, mean WTP estimates are able to provide some insight into the relative importance of the different attributes. In this respect, it is surprising that the presence of ethical standards is found to be much more important than organic production. In fact, the results suggest that this quality is far and away the most valuable for participants of all those considered. One potential explanation which emerges from the literature is the tendency to associate ‘fair’ production with local, small-scale production (e.g. Darby et al., 2008; Meas et al., 2014). Though the interaction between the two attributes (*Local x Fair*) is not found to be significant (see Table 4.4), the presence of such an association could explain why so many individuals perceived their typical tomato to be fair. When it comes to the status of fair production as the most important attribute in the experiment, however, there is an important caveat worth mentioning. Notably, the relevant WTP estimates for country of origin and retail format needs to be interpreted relative to their reference levels. Hence, the fact that individuals are willing to pay 1.26€ less for tomatoes from Mexico and 0.91€ more for locally produced tomatoes must be seen in relation to the implicit value of a tomato from Spain. If we would instead suppose Mexico to be the base level for this attribute, it can be said that individuals are willing to pay 2.17€ more for local tomatoes – which is more than the amount for either organic production or ethical standards. The prominent status of local production relative to other production-relation attributes reflects the ranking that has been previously established by other studies of sustainable consumption (Costanigro et al., 2011, Hu et al., 2009; Meas et al., 2014; Onozaka et al., 2011). In addition, since the average cost of 500g of tomatoes is around 2€ in the experiment, the estimate for local production is broadly similar to that of Darby et al. (2008), who find that individuals are willing to pay between 48% and 118% more for a product that was locally produced instead of one of unknown origin. In fact, given that no one identified ‘Mexico’ as an attribute of their typical tomato, it seems that this attribute level was surprisingly close to representing an unknown in this specific sample.

In sum, the WTP estimates reflect the broad significance for sustainable consumption of not only process-related attributes such as organic and fair trade but also retail formats. Given the size of the WTP estimates, it is apparent that such attributes are especially relevant for the case of fresh produce such as tomatoes and in a market like Germany. On a final note, though the estimate of willingness to pay for the coincidence of two distinct labels such as organic and fair trade is not calculated, it can be inferred from the significant interaction effect reported in Table 4.4 that the total value of the two is less than the sum of their separate values. The determination that the combined effect of these two labels is not additive echoes the findings of other studies in the literature (e.g. Bond et al., 2008b; Meas et al., 2014; Yue and Tong, 2009). In addition, this estimate contradicts other studies which find no significant relationship between organic production and fair trade (cf. Onozaka and Thilmany McFadden, 2011).

#### 4.6.4 Interactions with socio-demographic characteristics

Representing the final step in model specification, potential interactions between attributes and socio-demographic characteristics are considered. Owing to our broad interest in the main effects and interactions for the different attributes, the decision is made to not enter socio-demographic factors on their own in the model. Instead, by focusing on their interactions with quality claims, we can explore how individuals differ in terms of their evaluation of specific qualities, and thus which factors are impactful for purchasing decisions. This approach also avoids further adding to the confusion in the literature that emerges from the conflicting and generally ambiguous results about demographic variables. Regarding the interactions of the attributes with socio-demographic characteristics, it is necessary to whittle down the set of possible interactions given the number of combinations that exist. However, since it is equally crucial to not presuppose which interactions might be relevant, the potential significance of all interactions is thus considered separately, one factor at a time, by integrating them in the mixed-effects model with interactions between the attributes. After doing so for each of the nine characteristics, the significant interactions from the separate estimations are taken and estimated in the final model (see Table 4.4).

Six attribute-demographic interactions are found to be at least moderately significant ( $p < .10$ ). Two of these involve the discounter format, notably, its interactions with nationality and gender. Since the first interaction (*Discounter x Citizenship*) is positive, it can be inferred that Germans are more likely to

purchase tomatoes from a discounter. Although this effect could be expected given that the discounter represents the ‘German model’ of retailing (Wortmann, 2004), the small number of individuals in the sample who are not from Germany suggests that this result should be interpreted with caution. Meanwhile, the negative interaction between discounters and gender (*Discounter x Gender*) indicates that men are more likely to purchase tomatoes from this format than women. In a similar vein, as shown by the positive coefficient of the interaction between price and gender (*Price x Gender*), women are likely to spend more when purchasing tomatoes, suggesting a willingness to pay more for higher-quality products. Due to the association between discounters and lower prices, it thus makes sense to see the results as mirror images of each other.

In addition, a few interactions with the distinct features of sustainable production are found to be significant. Notably, there is one interaction between socio-demographic factors and the attributes of fair, local, and organic production which is found to be significant. As such, it is established that individuals living in larger households are less likely to purchase tomatoes produced using ethical standards (*Fair x Household Size*). Though the significance of this effect is immediately surprising, it should be noted that the size of the effect ( $\beta = -.26$ ) is relatively small if compared to others in the model. This qualification aside, it is possible to explain this result by noting that this experiment was conducted in a small city where students are quite prevalent. In this regard, a larger household can represent not only a family home with multiple children but also a living situation where students share a residence. If the latter predominates, as seems to be the case in our sample, it becomes easier to explain why these participants are less likely to purchase fair tomatoes. In a similar fashion, it is determined that individuals who are fully-employed are less likely to purchase organic food (*Organic x Employment*). While this result seems puzzling, it must be noted that individuals not considered as ‘fully-employed’ for the purposes of this experiment include students and stay-at-home parents. Consequently, the sign of this interaction need not indicate that individuals who are fully employed place less value on organic tomatoes, but rather that those such as students and stay-at-home parents potentially place a higher value.<sup>27</sup> Finally, there is a positive interaction between

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<sup>27</sup> The decision is taken to include only employment and not income since the two are highly correlated. Given the nature of our sample, moreover, employment allows for a more straightforward interpretation, e.g. current life status. On a related note, age is coded into two distinct groups: (1) individuals from 18 to 27; and (2) individuals 27 and older. This strategy is used to highlight those individuals who are younger and perhaps still finding their way. Nevertheless, none of the interactions with this characteristic prove even remotely significant in the final model.

having children and local production (*Local x Children*), articulating that parents are more likely to consume locally. Although only significant at a level of  $p < .10$ , this result indicates that those with children potentially look to local products in order to feel more assured about their consumption choices.

## 4.7 Conclusion

By conducting a hypothetical discrete choice experiment with opt-out option, this chapter is able to explain how retail formats matter for sustainable consumption. It is concluded that there are (at least) two potential mechanisms by which formats impact individual behavior. First, as illustrated by the example of discounters, the type of retail format can directly influence consumption. No matter the product or product attribute under consideration, the fact that it is sold at a discounter makes individuals less willing to purchase, at least not without a significant price discount. This finding underscores that retailers and retail formats also have a part to play when it comes to quality assurance, that is, in addition to certification systems and labeling schemes. Furthermore, the type of retail format represents a potential barrier for engaging in sustainable consumption as well, and for reasons beyond price or availability. As a second potential mechanism, given the many interactions with product attributes found to be significant, it is established that differences among retail formats are also relevant for evaluating quality claims. Notably, since individuals are not able to verify whether a product is actually organic or fair, the perceived trustworthiness of retailers becomes a critical ingredient. As a result, the formats of organic retailers and discounters are found to significantly differ from supermarkets in relation to the value associated with attributes related to the production process such as local and organic production. In order to explain why retail formats matter for sustainable consumption, it is thus important to consider both the direct impact of the type of retail format and its interactions with the various dimensions of product quality.

Besides exploring the relationship between retail formats and sustainable consumption, this study is also, to our knowledge, the first in the literature to employ participants' consumption histories to make choice tasks more realistic. The use of an individually-specified status quo is especially relevant in view of the preference heterogeneity in the sample – and in studies of sustainable consumption in general for that matter. Nevertheless, the potential for this approach to be widely used in order to provide more accurate estimates of

willingness to pay is limited by difficulties which have emerged in this study. First and foremost, the answers of respondents regarding their status quo seem somewhat unrealistic for the attributes of country of origin and ethical standards. While such problems can be put down to the difficulties of trying to utilize a new approach, it is notable that they are not present for all attributes. For this reason, it is possible that these issues reflect either limited awareness on the part of consumers or that specific attribute levels fostered confusion on the part of participants. While the latter issue is somewhat easily resolved by avoiding possible options such as Mexico, the former proves somewhat problematic for the continuing use of this approach since it relies on individuals to provide answers that reflect their actual consumption histories.

There is, however, another possibility which demands further consideration, notably the existence of social desirability bias (Fisher, 1993; Lusk and Norwood, 2009). That is, even though data collection was made as anonymous as possible via the use of computers, the possibility of Hawthorne (or observer) effects remains where the questions were answered in a manner that presented the participants in a certain light to researchers or even themselves. Although such complications are somewhat endemic to survey methods, some possible strategies seem useful for further research. Notably, Lusk (2003) suggests the value of a ‘cheap talk’ strategy whereby individuals are informed at the outset of their potential bias, i.e. to report a higher willingness to pay than actually correct, in order to reduce its possibility. In another approach, participants are asked ‘indirect questions’ about what they believe the average American would choose in order to attain more accurate representations of value (Lusk and Norwood, 2009). Both strategies certainly merit further consideration, especially for discrete choice experiments relying on choice tasks to infer individual preferences. Moreover, another potential approach that is intriguing in this respect is a ‘non-hypothetical experiment with real economic incentives’ as described by Yue and Tong (2009). In this study, just like the one described in this chapter, participants were asked to complete a set of choice tasks. As a point of divergence, however, one of the scenarios was then randomly drawn and individuals were requested to actually make the relevant purchase. In addition to helping reduce the possibility of ‘hypothetical bias’, this would represent an elegant solution for ‘rewarding’ individuals with tomatoes (or any other relevant product) upon completion of the survey – as requested in our post-experiment interviews.

Representing another potential consideration for future research, it is perhaps necessary to look into other possible versions of the opt-out option. Notably, it has

been argued within econometric studies exploring alternative ‘opt-out’ formats that the use of a ‘no purchase’ treatment might bias individuals in a particular direction (e.g. Kontoleon and Yabe, 2003). Due to problems such as respondent fatigue and decision conflict when asked to make choices, it is specifically shown that there is a bias toward the opt-out option, for instance, in response to an unattractive choice set or to an overly challenging choice task. In the context of the present study, it should be noted that our experimental design actually included both types of ‘opt-out formats’ which are discussed in the form of the individually-specified status quo and the opt-out option. Furthermore, by looking at the results of the specific choice task, it is also evident that individuals tended to opt out of making a choice more frequently when it involved less-desirable alternatives. This suggests that selecting the opt-out option indicated that something did not seem to make sense in the choice task rather than the desire to avoid difficult decisions. Nevertheless, in order to not only improve the viability of the opt-out option but also the assignment of individually-specified status quos, the consideration of a wider variety of opt-out formats and the particular conditions where they are applicable is broadly relevant.

In view of the substantial preference heterogeneity in the sample, it is moreover conceivable that some of the significant results, or conversely non-significant results, are the consequence of the participants being clustered together into a single group. For instance, it might be that there are individuals for whom a significant difference exists between organic retailers and supermarkets, though this result is ‘drowned out’ in the preferences of the entire sample. For this reason, further analysis is necessary of the underlying heterogeneity in the sample to gain additional information about individual preferences as well as how the significant attributes potentially differ across groups of individuals. In this regard, a latent class specification represents a possible method to tease out some of the unexplained heterogeneity in the dataset (e.g. Greene and Hensher, 2003; Lagarde, 2012). In particular, by accounting for the fact that individuals do not always take into account all available information when making decisions, i.e. attribute non-attendance, this model is able to better distinguish which attributes matter most for individual preferences and, as a result, provide better estimates of willingness to pay (Hensher and Greene, 2010; Hole, 2011; Scarpa et al., 2013). In line with our aim of understanding the foundations of sustainable consumption, this particular approach thus facilitates a more fine-grained analysis of how qualities such as organic and local production and, what is more, the different types of retail formats impact consumer behavior.



On a broader note, it must be noted that it is somewhat difficult to draw general implications from this study given the somewhat limited sample size. Similarly, the fact that students are quite prevalent, while broadly representative of the experimental context, makes it potentially difficult to translate these results to other situations. For this reason, it is necessary to consider the use of online surveys in order to establish how robust the results are to a change in context. In addition, due to the distinctiveness of the German market, an online format would facilitate the comparison between it and other markets in order to ascertain if perceptions of retail formats vary by country. However, both the significance of the results and the valuable insights provided into a little-studied aspect of sustainable consumption validate this experimental design. However, regarding how it might be improved, it could be argued that considering the type of retail format as an attribute of the product is questionable, especially given the existence of habits for where we go shopping. Notably, treating the decision to purchase a tomato from a farmers' market to be the same as deciding to visit a farmers' market for the express purpose of purchasing tomatoes is potentially inappropriate.<sup>28</sup> In fact, a number of studies in the retailing literature have characterized format choice as a decision that is separate to, and generally precedes, consumption (e.g. Hsieh and Stiegert, 2012). While remarking that the approach of this chapter remains justified by our interest in the relationship between retail formats and quality assurance, we wholeheartedly agree that this represents a crucial direction for future research seeking to explore how where I shop influences what I buy.

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<sup>28</sup> Thanks go to a participant at the 2014 International Congress of Applied Psychology in Paris for raising this point.

## Appendix A

The finding detailed in Section 4.6.2.1 also proves robust to choice of information criterion. According to the Akaike Information Criterion (AIC), for instance, the mixed-logit model with two-way interactions and interactions with socio-demographic characteristics (AIC = 1477.59) is again superior to the mixed-logit model with two-way interactions (AIC = 1528.54) and the base mixed-logit model (AIC = 1645.37). Since AIC penalizes the addition of another parameter less heavily, it is not surprising that the full model appears an even better fit according to this criterion. Due to the somewhat small sample size, we decide to utilize BIC to place a stronger penalty on additional parameters. It can be noted that according to at least one of the criteria, Consistent Akaike Information Criterion (CAIC), there is little gained from the inclusion of the interactions with socio-demographic characteristics. This suggests that such interactions are not the most important feature in the estimation results (see Table A.1).

**Table A.1: Information criteria for the models**

|                         | MLM without interactions | MLM with two-way interactions | MLM with two-way and socio-demographic interactions |
|-------------------------|--------------------------|-------------------------------|---|
| Numbers of respondents  | 125                      | 125                           | 123   |
| Numbers of observations | 5424                     | 5424                          | 5334  |
| Log-likelihood          | -809.68                  | -739.27                       | -697.80   |
| BIC                     | 1682.13                  | 1599.25                       | 1592.89   |
| AIC                     | 1645.37                  | 1528.54                       | 1477.59   |
| CAIC                    | 1695.13                  | 1624.25                       | 1633.89   |

*Notes:* MLM = mixed-logit model; BIC = Bayesian information criterion; AIC = Akaike information criterion; CAIC = consistent Akaike information criterion.

## Chapter 5

# The Missing Link between Research and Reality: The Significance of the Relationship between Retail Format and Organic Food Consumption

### 5.1 Introduction

The number of questions that have arisen from the continuing evolution of organic consumption signals that not as much is known about the determinants of this behavior as might be expected.<sup>1</sup> Broadly speaking, most accounts of the substantial growth in the organic sector emphasize the fact that global sales have increased fourfold over the last decade to currently equal around \$64 billion (Sahota, 2014). Similarly, there is frequent mention as well of the increasing familiarity of organic products in the shopping baskets of consumers and on the shelves of retailers everywhere. Consequently, in the United States (the largest market for organic food), most families (81%) identify themselves as (at least) occasional consumers of organic food (OTA, 2013) while the majority of retail formats (82%) make sure to have organic products on offer (Food Marketing Institute, 2008). However, owing to how often extensive growth is highlighted in this sector, there is a limited understanding of the more specific reasons why individuals do or do not decide to actually purchase organic food. In this regard, the greater acknowledgment of puzzles like the attitude-behavior gap and the fact

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<sup>1</sup> An earlier version of the paper on which this chapter is based upon, is available as “The missing link between research and reality: The significance of the relationship between retail format and organic food consumption.” *Jena Economic Research Papers # 2013-049*, Friedrich-Schiller-Universität Jena and Max Planck Institute of Economics (MPI), Jena, Germany. I would like to personally thank Dr. Stephan Bruns for his advice regarding the empirical illustration.

that levels of passion and commitment vary across consumers is seen to require the reconsideration of the fundamental separation of individuals from context in the literature.

Before delving into these issues in greater detail, it is valuable to contemplate why they have not been explored more fully. In the first place, the immediate argument is often made that consumers are not willing to make the ‘sacrifice’ necessary to purchase organic food, regardless of whether that sacrifice is phrased in terms of cost, convenience, or something else. Instead, organic food is resultantly characterized as a luxury good, or a product which must be made easier to purchase. However, even though the recent recession gave rise to rumors of its demise, the organic market in the United States continues to grow more than 5% annually while also creating jobs at four times the national average (OTA, 2012). And yet it must also be noted that although the prevalence of organic consumption is increasing over time, the most substantial portion of this growth is chiefly the result of the actions of a minority of dedicated consumers (Padel and Foster, 2005; Pearson et al., 2011). As a result, the growth in organic consumption is not taking place evenly given that only this small subset of consumers is deepening its level of consumption and quickly expanding to new product categories (Hartman Group, 2010). In order to better understand the evolution of organic consumption, it is therefore necessary to explore how the most passionate individuals are able to find the greater energy to consume sustainably.

Another feature of the ongoing transformation in the food industry takes on greater significance in this regard: the (re-)emergence of retail formats that place greater emphasis on shorter supply chains and more personal connections with food producers.<sup>2</sup> In specific, the market in the United States for agricultural products sold directly to consumers has recently surpassed \$1.3 billion (USDA, 2014). Moreover, such growth is accompanied by the advent of novel networks and institutions which help to realize a viable alternative to the established regime of industrial agriculture. For instance, the number of farmers’ markets increased by 150% between 1994 and 2006 alone, while national sales through such channels currently exceed \$1 billion (Brown and Miller, 2008). In addition, similarly explosive patterns are apparent for innovative arrangements such as community-supported agriculture (CSA) which are founded more on a partnership between farmer and consumer. Although such structures were practically

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<sup>2</sup> For the sake of diversity and ease of exposition, this chapter utilizes terms such as ‘retail format,’ ‘retail context,’ and ‘shopping venue’ interchangeably when referring to the place where consumers interact with actors from the supply chain. That is, even where a permanent venue does not exist as in the case of farmers’ markets.

nonexistent two decades ago, 12,617 CSAs are currently operating in the United States (USDA, 2014).

The increasing diversity in the retailing sector thus represents an important development which is occurring parallel to the growth in organic food consumption. Hence, it is vital to inquire into the potential relationship that exists between retail formats and consumer behavior. The importance of doing so is further reinforced by the rather fragmented treatment given to this relationship in the literature so far. To be sure, it is widely remarked that the shopping venue represents a significant determinant of organic consumption (Thompson and Kidwell, 1998; Zepeda and Li, 2007); yet in view of research establishing the association between alternative formats and the greater depth and frequency of such behavior (e.g. Hsieh and Stiegert, 2012), it is moreover necessary to further explore the potential richness of this relationship.

To this end, a discussion of individual motivation is considered in order to establish the broader scope of the relationship between alternative retail formats and organic consumption. Rather than emphasizing only individual factors, it is specifically argued that differences in the energy and motivation to consume organic food arise from a particular type of relationship between individual and retail context. As a result, three distinct ‘sources’ of motivation are actually present: (1) a strictly individual source of motivation; (2) another which emerges from the facilitating role of context; and (3) the increasing quality of motivation which is developed by the aforementioned relationship between the individual and the retail context. The consideration of these three distinct sources of motivation offers a novel perspective to make sense of the unexplained differences in energy, which are generally set aside as curiosities. In this regard, if we wish to explain preference heterogeneity in this domain, it is necessary to look into the complexity of individual behavior wherever it appears.

As to why such efforts are not readily forthcoming in the literature, many potential explanations can be put forward. For the purposes of this chapter, the paradigmatic reliance on specific modeling frameworks is studied. Using the methodological framework outlined by Dewey and Bentley (1949), an empirical illustration is developed to demonstrate the potential for omitted variable bias and misleading policy advice when making concessions to bring new insights into accordance with established models. In this respect, it is argued that attempts to increase the reality of descriptions of consumer behavior remain incomplete so long as such attempts are filtered back through frameworks developed with a different relationship between individual behavior and retail formats in mind.

The next section reviews the literature to develop the potential relationship between retail formats and individual behavior in the context of organic consumption. Section 5.3 engages in a more general discussion of how contextual factors are used to explain differences in individual motivation. Section 5.4 then utilizes these insights to establish the types of relationships which exist between retail formats and organic consumption. On this basis, Section 5.5 extends the discussion of the three distinct sources of motivation through an empirical illustration that explores the consequences of overlooking one of the sources when modeling the determinants of consumer behavior. Section 5.6 then presents the results of this illustration, while Section 5.7 discusses the implications for the literature on organic consumption. Section 5.8 concludes.

## 5.2 Determinants of organic consumption

Most discussions of organic consumption begin with the attempt to identify socio-demographic characteristics such as age, gender, and income which are associated with a greater probability of consuming in an organic fashion. However, surveying the literature on organic consumption, Diamantopoulous et al. (2003) conclude that such factors are not adequate predictors of either environmental knowledge or environmental behavior. In fact, the ambiguous effect of demographic variables is widely established in the literature on organic consumption (e.g. Li et al., 2007; Yiridoe et al., 2005; Zepeda and Li, 2007). For this reason, there is impetus to deepen the understanding of organic consumption by considering the role of psychological factors such as attitudes and intentions (Ajzen, 1985, 1991; Armitage and Conner, 1999; Conner and Armitage, 1998). Yet again however, it is increasingly recognized that there is a gap between attitudes and behavior given that “not everyone behaves in accordance with their intentions” (Conner and Armitage, 1998: 1450). Further additions are thus made to the set of explanatory factors determining why some individuals engage in pro-environmental behavior more often. A selection of the suggested supplemental factors includes: self-identity (Sparks and Shepherd, 1992); habit strength (De Bruijn et al., 2007; Verplanken and Wood, 2006; Wood et al., 2005); motivational orientations (De Boer et al., 2009); and values (Stern, 2000; Stern et al., 1999).

By making it possible to sketch the portrait of the prototypical organic consumer with ever greater clarity, enhancing the set of individual-level factors represents one strategy to improve explanations of organic consumption. Nonetheless, the

recurrent emergence of puzzles like the attitude-behavior gap (Kollmuss and Agyeman, 2002; Sheeran, 2002) and value-action gap (Barr, 2006; Blake, 1999) suggests the difficulty of relying on these factors alone. For this reason, greater attention must also be given to contextual factors. In the case of organic consumption, the relationship between behavior and context can operate through a number of mechanisms. For instance, reflecting the consideration of one aspect of the social environment, Welsch and Kühling (2009) are able to account for half of the explained variance in consumer behavior by controlling for the consumption patterns of friends, neighbors, and relatives. In this regard, the influence of reference groups is found to equal the overall effect of demographics, attitudes, and factors such as price and income. Taking a closer look at the situational context, moreover, it is similarly demonstrated how where one shops influences what is purchased, for instance through its impact on memory and product familiarity (Kahneman et al., 1997). Going one step further, Ariely and Norton (2008) argue the impact of situational context to be so strong that the activities undertaken therein are expected to create, not just reveal, preferences.

Accordingly, explanations of organic consumer behavior have benefitted from the greater consideration of where products are purchased. Notably, not only is the retail format shown to be one of the most significant determinants of organic consumption (Thompson and Kidwell, 1998; Zepeda and Li, 2007), it is further demonstrated that the type of retail format has a strong impact on ostensibly individual characteristics like quality perception and price sensitivity (Hsieh and Stiegert, 2012; Umberger et al., 2009). Even the value assigned to organic products is thus seen to vary based on the format. Not to mention, if one looks closely, it is evident that the samples of organic consumers are often drawn from the individuals shopping at alternative formats (e.g. Schifferstein and Oude Ophuis, 1998). Hence, the preferences these consumers express can be suggested to implicitly depend on their experiences in the ‘latent’ formats. Generally speaking, however, there is little further consideration of the role of retail formats or how they are to be distinguished. Instead, there is a vast amount of literature detailing the association between the type of product that an individual is likely to favor, e.g. conventional or organic, and the location where they shop, e.g. supermarket or farmers’ market (e.g. Yue and Tong, 2009). But beyond noting the existence of such regularities, there is little other discussion of how such an association might emerge, with only a few notable exceptions in the literature.

Nevertheless, given the paucity of these exceptions, they prove especially helpful for gaining further insight regarding how to improve explanations of organic

consumption. For instance, if some individuals obtain more value from organic consumption, one potential reason is the greater opportunity to get to know the people involved in production. While many possible reasons can be provided for why quality perception and price sensitivity differ by format, one of the most obvious emerges from the greater importance of credibility for organic products. Notably, since individuals are not able to verify on their own whether or not a product is actually organic, claims of this sort must instead be evaluated on the basis of the credibility of sellers (Dentoni et al., 2009). Identifying the “core of trust” underlying decisions of organic consumption, Ayres and Midmore (2009: 29) observe that individuals who received the most value from organic products in general also turned out to be those expressing a severe distrust of such products when sold at supermarkets.

In view of the fundamental importance of the situational context, it might be suggested that the individuals who ‘inhabit’ a retail format are significant as well. Accordingly, what distinguishes some retail contexts from others is not only the price or variety of the assortment but also the likelihood to interact with actors from the supply chain. It is therefore worth noting that the perception that a retail format is credible and deserving of confidence is explicitly linked to the likelihood of attaining advice from sales personnel and, what is more, a sense of ‘not feeling anonymous’ (Brown, 2002; Hinrichs, 2000; Zanolli and Naspetti, 2004). In fact, the broader significance of this type of personal contact is shown to foster a strong, dynamic connection between the level of consumer expertise and ‘point of sale’ aspects such as the degree of interaction with producers (Padel and Foster, 2005; Zanolli and Naspetti, 2004). In other words, consumers that are able to derive more value from consumption appear to be those that have been able to learn more, both about the products and their preferences, from sustained exchange with producers. For the particular case of community-supported agriculture (CSA), Russell and Zepeda (2008) establish that consumers actually ‘adapt’ their preferences to this arrangement by developing a greater preference for seasonality, an appreciation for the task of farming, and an enhanced enjoyment of cooking. As a result, the greater degree of interaction that is fostered in this type of retail format suggests the need to examine the richer relationship between contextual factors and individual behavior.



### 5.3 Contextual factors, and individual passion and motivation

In relation to environmentally-relevant behavior as a whole, Steg and Vlek (2009: 312) observe that “contextual factors have not been examined systematically [which] is remarkable given that environmental psychology aims to study transactions between humans and their environment.” The greater appreciation of the relevance of context for individual behavior is therefore put forward as one of the orienting themes for research in this field. As a contribution in this direction, the authors outline a number of broad mechanisms by which contextual factors work. The mechanisms range from a direct one, like an absence of facilities making it difficult to engage in recycling, to the indirect where context has an impact only by way of modifying the attitudes or norms of the individual to, finally, the more interactive where a change in context only affects the behavior of individuals with certain characteristics. Emerging from this discussion, a few crucial details require further consideration. First, those diverse mechanisms described by Steg and Vlek (2009) speak to the various functions that contextual factors might exercise. As a result, it becomes necessary to consider the distinct relationships which might characterize the interaction of individual factors, contextual factors, and behavior. Notably, to use the vernacular of psychology, the above mechanisms might be portrayed not only in the straightforward terms of a direct relationship between context and behavior but also require a more complex expression based on mediating relationships and moderating relationships, for example.<sup>3</sup> The failure to take into account these more complex forms of interaction limits the potential understanding of the relationship between individuals and contexts.

Belying the desire to attain a deeper appreciation of contextual factors, it can moreover be seen that the ostensibly dissimilar mechanisms outlined by Steg and Vlek actually reflect the limited consideration of a select few features of the context. In specific, the list of contextual factors relevant for pro-environmental behavior is largely populated with aspects of the ‘socio-technical’ context such as material costs and rewards, laws and regulations, technological infrastructure, supportive policies, and advertising. On the one hand, this particular emphasis makes sense given the types of behaviors which tend to be studied in this

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<sup>3</sup> More detail about these relationships will be provided in Section 5.5 along with the descriptions of the models.

literature, e.g. household energy use, transportation behavior, recycling and conservation. For such behaviors, this broader level of the context is repeatedly shown to have a significant impact, thus stressing how it becomes viable to focus on, for instance, the choice set available to consumers or the greater difficulty of engaging in a specific behavior. In this regard, there is no question of the relevance of considerations such as convenience and availability for pro-environmental behavior (e.g. Dietz et al., 2009; Knussen et al., 2004; Ölander and Thøgersen, 2006).

By focusing on why it is difficult to engage in a behavior, however, there is a strong risk for aspects of the relationship between individual and context to be overlooked. Most notably, it is not possible to explain why some individuals are better able to follow through on their stated intentions to act in a pro-environmental fashion. Instead, the behavior of these more passionate individuals is left unexplored or put down to the more elusive aspects of individual motivation, making it difficult to grasp how differences between individuals emerge. Returning to Steg and Vlek (2009), since it represents one of the more considered examinations of contextual factors, the limited discussion of the relationship between context and motivation is important in this regard. Following goal-framing theory (e.g. Lindenberg, 2001, 2006), the authors contend that the salient circumstances can determine which motivations are strongest at a given moment. In particular, conceiving of motivations as goal frames, Lindenberg and Steg (2007) argue that the emphasis on a ‘gain’ goal frame in a given context, perhaps because of the importance assigned to money and power, might lead individuals to focus on relevant considerations.

Though this framework does afford a more substantial role to the situational context, it remains unable to explain where the differences in the energy and passion of consumers come from. For this purpose, a new conception of consumer behavior is required: one that moreover emphasizes the ongoing relationship between individuals and their nurturing contexts. In both respects, the notion of ‘consumer empowerment’ outlined by Thøgersen (2005) stands apart. In particular, setting forth the need for a theory of motivation, Thøgersen (2005: 159) argues that “it is not sufficient to make them *do it*, or to explain *why* they do it ... [but] to explain the variations in the *energy* that people put into ... the goal of environmental protection (or other sustainability relevant goals).” Contrary to the emphasis on individual-level factors alone, it is not possible as a result to elucidate how greater levels of passion and interest develop so long as differences in motivation are reified as stable factors of individuals. Instead, explanations as

to why capabilities and motivation might evolve in a variable fashion must look to the nature of the connection between individual and context. In this regard, it is underscored that consumer empowerment can be understood in one of two different senses, notably a ‘negative’ sense and a ‘positive’ sense (Thøgersen, 2005). The negative sense – with its accents on “removing or reducing constraints and limitations that impede consumers’ ability to change lifestyles in a sustainable direction” (p. 153) – is reflective of the substantial emphasis on availability and convenience in the literature. However, since the facilitating role of context is only one of two possibilities for ‘empowering’ individuals, such factors do not sufficiently account for the impact of context on individual behavior. Instead, it must be explored how contextual factors might also be able to strengthen “intrinsic tendencies and capabilities so as to increase consumers’ propensity to initiate changes themselves and to persist in their striving” (p. 153). In this case, it is less a matter of external conditions becoming more accommodating so much as the behavior of the individual no longer being as dependent on context. As a result, the full measure of how the context influences individual behavior is not reducible to how, for example, purchasing organic food becomes easier – but also how contexts foster the further development of the capacities of individuals so that undertaking more difficult, complex behaviors no longer seems so inconceivable. With regards to why some individuals have more passion and energy, it is therefore the case that “motivation and capabilities may not only be set free, but could actually be extended” (Thøgersen, 2005: 154).

#### 5.4 The relationship(s) between retail formats and organic consumption

In order to establish the more positive impact of contextual factors on consumer motivation, it is crucial to now return to the relationship between retail formats and organic consumption. Owing to the broad emphasis on the socio-technical context when studying pro-environmental behavior, little consideration is given to the relevance of more situational factors.<sup>4</sup> However, given that the situational context of shopping venues is where the act of provisioning ultimately takes place, the reliance on a somewhat abstract and general notion of context is inappropriate. In its place, the conceptual frame of retail formats – specifically,

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<sup>4</sup> Again, one exception in this regard is goal-framing theory (e.g. Lindenberg and Steg, 2007), though the rather static relationship between context and motivation must also be highlighted.

the functions which such formats are seen to perform – is utilized to provide a more considered examination of the relationship between context and behavior.

From the outset, it can be noted that conceptions of the role of retail formats vary widely in the literature. However, two understandings seem to typically prevail: (1) an entity separate from preferences selected by individuals for its perceived characteristics; and (2) a set of facilitating conditions that make consumption cheaper and easier. The first is most apparent in discussions of the influence of ‘store effects’ on the frequency of organic consumption (Schifferstein and Oude Ophuis, 1998; Thompson, 1998). The second is evidenced by accounts of the format as “*indirectly* important for understanding decisions to buy organic produce” (Thompson and Kidwell, 1998: 285, *emphasis added*). In fact, according to descriptions of this kind, the relevance of formats is specifically characterized by their capacity to make organic products cheaper and more widely available (Vermeir and Verbeke, 2008; Zepeda and Li, 2007).

Reflecting the distinct functions assigned to retail formats, moreover, each conception is seen to represent a specific relationship between individual and context. That is, while both share an appreciation of how individual-level factors like socio-demographic characteristics and product knowledge are relevant, the manner in which other factors influence organic consumption is seen to change depending on the role occupied by retail formats. Starting with those discussions outlined in terms of store effects, the type of retail format tends to be included as an additional control variable to reflect its importance for consumption. In other words, the influence of this factor (or set of factors) is seen to be completely distinct from the individual factors which are found to be relevant, illustrating a relationship where the respective factors have an additive impact on consumer behavior. Accordingly, to capture this source of preference heterogeneity, a growing number of studies have attempted to connect the decision to frequent a particular shopping venue to a range of individual-level factors which include motivation, demographics, and economic considerations (e.g. Bond et al., 2008a; Keeling-Bond et al., 2009). Notably, since a shift in preferences is likely to occasion a change in shopping venue as well, it is expected that the venue plays a role in “‘sorting’ consumers with similar motivations and values” into relevant categories (Onozaka et al., 2011: 583). As such, shopping venues (or retail formats) represent yet another characteristic which can be used to segment consumers.

Although reflecting an initial step to establish why retail formats matter, a notable shortcoming of such accounts is that each decision of the individual, whether

regarding organic consumption or the choice of a specific store format, is reduced to static characteristics and dispositions. As a result, not only is the relevance of retail formats thereby limited, but it implies that variations in energy and motivation can only be explained as innate individual differences. For this reason, the potential that retail formats might ‘enable’ organic consumption is suggested in order to improve the reality of descriptions. In specific, representing an expansion in the mechanisms linking individual behavior and retail context, it becomes possible to enumerate the constraints on organic consumption (Ölander and Thøgersen, 1995; Zepeda and Li, 2007). For instance, the Motivation-Opportunity-Ability (MOA) approach by Ölander and Thøgersen (1995) characterizes the importance of the context as a set of facilitating conditions allowing individual motivation to be more fully expressed. The role of the retail format is therefore seen to unlock the potential for organic consumption, perhaps by making it possible for attitudes, values, and demographic variables to become more directly impactful for behavior. Whatever specific mechanism is at work, this understanding of the relationship between retail formats and behavior clarifies that the motivation of the individual to act does not depend on the individual alone.

Nevertheless, since this specific illustration of retail formats is most relevant for considerations such as convenience and cost, it remains difficult to explain differences in passion across consumers. Given the emphasis likely to be placed on removing constraints and improving availability as a result, this approach is broadly oriented by a ‘negative’ sense of empowerment (Thøgersen, 2005). In order to identify the more ‘positive’ features of the relationship between retail formats and individual motivation, we might follow Thøgersen’s lead and consider insights from self-determination theory (SDT).<sup>5</sup> Generally speaking, studies in this strand of literature show how the *quality* of individual motivation is influenced by aspects of the socio-cultural context (Deci et al., 1999; Deci and Ryan, 2000). Notably, when contexts are seen to be too controlling or unpredictable, individuals begin to identify the motive for their behavior as external to themselves, resulting in a diminishing level of intrinsic motivation (e.g. Deci, 1971; Lepper et al., 1973). Regardless of their overall level of motivation which might exist, e.g. from the presence of financial rewards or deadlines, decreases in motivational quality are able to explain why individuals

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<sup>5</sup> To the best of our knowledge, the literature on self-determination theory is rarely considered in economics, with the paper by Pugno (2008) serving as a singular exception in this respect. In part, this chapter thus represents an attempt to demonstrate the relevance of insights from this theoretical framework for studies of consumption behavior.

feel helpless or ‘amotivated’ to undertake environmental behaviors (Pelletier et al., 1999). In addition, the level of motivational quality proves to be a significant predictor of the frequency of environmental behavior and the degree of behavioral persistence, particularly for those that are perceived to be more difficult (Green-Demers et al., 1997).

Overall, the relevance of self-determination theory for exploring the impact of the contextual environment on individual motivation is broadly demonstrated. And yet, in order to establish how such insights can inform our existing conceptions of retail formats, it must be outlined more clearly which aspects are relevant for organic consumption. As such, it is necessary to identify the constitutive elements of the relationship between retail formats and individual motivation.<sup>6</sup> Returning to SDT, it can be noted in this regard that the quality of the connection between individual and context is associated with the fulfillment of three basic psychological needs: autonomy, competence, and relatedness (Deci and Ryan, 2000).<sup>7</sup> In the first place, this is significant given how closely these needs recall the descriptions of why alternative formats are unique, e.g. the ability to interact with producers, the possibility of attaining advice from sales personnel, and the sense of ‘not feeling anonymous’ (e.g. Brown, 2002; Hinrichs, 2000; Zanolli and Naspetti, 2004). Once more, it is outlined how characterizing retail formats in terms of product assortment alone is insufficient, notably due to the opportunity to interact with actors from the supply chain provided through such forums as well. And, what is more, since the satisfaction of psychological needs like relatedness and competence is shown to reinforce behavior, the greater satisfaction provided by particular retail formats potentially signifies an additional source of motivation, one not caused by the product itself. Instead, the quality of motivation which emerges from the nature of the relationship between individual and context represents a distinct motivational component, not able to be reduced to either individual factors or contextual factors alone. In other words, though there are aspects of motivation which originate from the individual, motivation is not only an individual factor, but also results from the quality of the relationship between individual and context.

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<sup>6</sup> For the sake of comparison, Thøgersen’s (2005) interest in developing policy implications for pro-environmental behavior drives him to apply the insights from self-determination theory to, for instance, evaluate the drawbacks of using guilt and obligation to communicate relevant information. While considering the implications for structural conditions also, this discussion is not pursued with any reference to the actual contexts in which behavior occurs.

<sup>7</sup> Deci and Ryan (2000: 262) contend that individuals “require nutriments or supports from social environments to function effectively” such that the level of need fulfillment provided by a context represents the basis of the relationship between individual and context.

Furthermore, even though the function of retail formats cannot be adequately expressed in terms of its product assortment, exploring the relationship between product and context can still offer insight into the relevance of credibility considerations. With regards to organic consumption, for instance, it is observed that decisions to purchase organic food are founded on a “core of trust” (Ayres and Midmore, 2009: 29) and, as a result, are broadly dependent on the perceived trustworthiness of sellers (Dentoni et al., 2009). Accordingly, in addition to the more relational aspects of retail formats, the further possibility exists for ‘feelings of rightness’ about the format in which provisioning takes place to influence the particular judgment of the product. In this regard, the framework of regulatory fit theory has demonstrated how the perceived value of a given activity can be bolstered by the improved fit between the context of an activity and individuals’ perceptions about how the context should look and feel (Higgins, 1997, 2000). That is, because an activity is undertaken in a context which is broadly harmonious with how individuals imagine this activity to be, there is likely to be an influence on the likelihood that said activity occurs more frequently.<sup>8</sup> It can therefore be inferred that the better fit between organic products and a particular type of retail format might represent a further source of value that cannot be directly attributed to the product. As a result, puzzling findings left unexplored in the literature like the correlation between alternative retail formats and the quality perception and price sensitivity of organic consumers (Hsieh and Stiegert, 2012; Umberger et al., 2009) can be explained by the relationship between product and context. Hence, the more holistic and ineffable aspects of retail formats become relevant for illuminating for example why it is precisely the more difficult-to-measure features, i.e. environmental and social considerations in the case of CSAs, which are found to be crucial for individual participation (e.g. Bougherara et al., 2009). Again, it is illustrated that the importance of the retail context is not subsumed by either product availability or information provision. Rather, there is something in the manner of experiential aspects of formats which are relevant for behavior, and which can explain not only why the value associated with organic consumption potentially varies by format but the motivation and energy of individual consumers as well.

In sum, by making use of insights from self-determination theory and regulatory fit theory, it is proposed that greater passion and commitment – rather than a

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<sup>8</sup> In many respects, this approach is compatible with the assertions of Ariely and Norton (2008) that the impact of the situational context is so prominent that it actually creates, rather than reveals, preferences. However, regulatory fit theory takes this argument one step further by establishing a more dynamic basis for preference learning.

stable and inherent characteristic of individuals – actually arises from the improved fit that occurs on two distinct levels: between product and context, and between context and individual. The two degrees of fit underscore the significance of the relational aspects of consumer behavior. Accordingly, it is necessary to re-examine the aspects of retail formats seen to be relevant for organic consumption to also include those such as the level of personal interaction and the ability to communicate with producers. This suggestion is set aside for future research, however, with the remainder of this chapter exploring the potential implications of this deeper relationship between individuals and context for the organic consumption literature.

## 5.5 Exploring the sources of individual motivation

### 5.5.1 A framework for individual motivation

The paradigm which presently frames our understanding of consumer behavior is characterized by a strong distinction between the roles of individual and contextual factors. As a result, a similar separation is also apparent among the more common approaches that are used to model sustainable consumption. Given that this limits what can be said about the relationship between individuals and their relevant contexts, however, the general reliance on such methodological approaches is often criticized, notably for how they forestall the possibility of exploring some avenues of research. In this regard, Hobson (2006: 297) ascribes the tendency in environmental psychology to illustrate the interaction between “contextual factors, material capabilities and habits as additive” to the reliance on methodologies which require the variables to be isolated from one another. As such, the understanding of how the factors relate to one another represents the inevitable consequence of the type of modeling approach which is commonly used.

For this reason, the potential to make inroads in explaining puzzles such as how retail formats are relevant and why levels of passion and energy vary across consumers is seen to first require the consideration of the prevalent modeling approaches. Otherwise, if the increasing complexity of consumer behavior is ultimately filtered back through frameworks initially developed with a different relationship between individuals and contexts in mind, it is more than likely that the same answers will continue to emerge. In order to better understand



preference heterogeneity in the domain of organic consumption, it is therefore necessary to explore the difficult-to-explain aspects of individual behavior wherever they appear. In this regard, the distinct relationships between retail formats and organic consumption that are outlined in the prior section present an interesting opportunity to explore variations in individual motivation. Notably, by expressing a different manner in which motivation is derived, each relationship can be said to correspond to a particular ‘source’ of motivation. The distinct sources of motivation which are identified are: (1) an individual-founded source of motivation, perhaps resulting from specific values or socio-demographic characteristics; (2) another emerging from the facilitating role of context to make consumption easier and more convenient; and (3) the increasing quality of motivation which arises from a specific type of relationship between individual and retail format.

The expression of the different sources of motivation offers a novel perspective for exploring organic consumer behavior, especially the unexplained variations in energy which are typically set aside as curiosities. There are many potential explanations for why such efforts have not been so forthcoming. For the purposes of this chapter, the paradigmatic reliance on modeling approaches which broadly correspond to those described in the previous section is specifically highlighted. In this manner, it becomes possible to directly consider how the deeper relationship between individuals and retail formats eludes our understanding owing to the specific types of models utilized. It is thus suggested that there is an essential disagreement in relation to how to a richer understanding of organic consumption can be attained. For instance, it can be argued on the one hand that maintaining existing modeling approaches while expanding the individual and contextual factors which are included in these models represents the best strategy to improve descriptions. In contrast, it could be contended that, in view of the puzzles that complicate such explanations, it is necessary to specifically reconsider how the relationship between individual behavior and retail format is modeled in order to advance theories of organic consumption.

In order to briefly consider these two perspectives, an empirical illustration is developed in the following sub-section to consider the potential for omitted variable bias and misleading policy advice to result from the continued reliance on established approaches to model the relationship between individual behavior and retail formats. Using the methodological framework outlined by Dewey and Bentley (1949), three different types of relationships – and their implicit understandings of the sources of individual motivation – are considered. First,

there is the ‘additive’ model where contextual and individual factors are seen to have distinct effects on behavior, exemplified by discussions of ‘store effects’. Second, the ‘interactional’ model envisions the retail format as a set of enabling conditions that make organic consumption easier and more convenient. Third and finally, there is the ‘transactional’ model where behavior is determined by the quality of the relationship between the individual and the retail format. While the name of the first model is used to reflect Hobson’s criticism of the literature on sustainable consumption, the names of the other two are adopted from Dewey and Bentley (1949). To briefly summarize their argument, these authors emphasize the importance of “seeing together, when research requires it, of what before had been seen in separations and held severally apart” (Dewey and Bentley, 1949: 134). In relation to organic consumption, it can thus be proposed that a richer understanding is most likely attained by pursuing a more integrated view of the relationship between individuals and retail formats. Accordingly, apparently individual characteristics such as passion and energy cannot be seen, to use their words, “as *of* the organism alone, any more than *of* the environment alone, but always as of the organic-environmental situation, with organisms and environmental objects taken equally as its aspects” (Dewey and Bentley, 1949: 192). In sum, the greater acknowledgment of puzzles such as the attitude-behavior gap and the varying levels of passion and commitment across consumers makes it necessary to reconsider the fundamental separation of individuals from context.

### 5.5.2 Developing the empirical illustration

The empirical illustration simulates a data-generating process (DGP) to explore the implications of making concessions to fit more complex relationships into established models. The particular consequences considered in this respect include the possibilities of omitted variable bias and misleading policy advice with regards to organic consumption. To be clear on this point, this exercise does not make use of actual data but instead postulates a core DGP in order to investigate what happens when different modeling approaches are utilized. A sufficiently large sample size of 1,000 ‘observations’ is derived to avoid an over-weighting of extreme results. For the sake of simplicity and clarity, the genuine effect of each coefficient is also set equal to 1 in the model which serves as the DGP, i.e. the transactional model. The decision is taken to utilize this model to characterize the actual state of the world so that the consequences of modeling the relationship between retail formats and motivation in a more limited fashion can be explored.

Moreover, its relevance for this illustration is more broadly founded on the evidence of the deeper transaction between retail formats and organic consumption which has been outlined in the foregoing sections.

Given the use of the transactional model as the reference model, its performance cannot be assessed. Instead, the main insights of this exercise correspond to the respective performances of the additive and interactional models relative to the reference transactional model. In fact, such evaluations are only possible since the ‘true’ relationship between motivation and context is already known. Due to the large number of observations included, it must be noted that the sizes of the test statistics are all grossly inflated and should not be directly interpreted. Hence, the absolute magnitude of the coefficient estimates and their levels of significance are less relevant than the extent of the disparity between the estimates and the genuine effect, with the latter again being set to 1. In specific, the degree of the disparity can be interpreted as the omitted-variable bias which exists in a given model. The possibility of informative results is therefore shown to be essentially dependent on the features of a given model. Drawing on the earlier discussion of retail formats and organic consumption, each of the models is founded on particular theoretical assumptions concerning the relationship between motivation and context. Here are the three models in equation form:

$$1) \text{ Additive Model: } DV = \beta_0 + \beta_1 D_i + \beta_2 M_i + \beta_3 C_i + u_i$$

$$2) \text{ Interactional Model: } DV = \beta_0 + \beta_1 D_i + \beta_2 M_i + \beta_3 (M_i * C_i) + u_i$$

$$3) \text{ Transactional Model: } DV = \beta_0 + \beta_1 D_i + \beta_2 M_i + \beta_3 CMT_i + u_i,$$

where

$$CMT_i = \beta_4 + \beta_5 M_i + \beta_6 C_i + \beta_7 (M_i * C_i) + u_i$$

The dependent variable in every model is the decision to consume organic food. As such, the independent variables represent factors which are shown to be generally relevant for consumer behavior. To keep the illustration fairly straightforward, only three independent variables are included: socio-demographic

characteristics ( $D_i$ ); individual motivation ( $M_i$ ); and context or retail format ( $C_i$ ).<sup>9</sup> The set of individual factors in this exercise is thus comprised of ‘socio-demographic characteristics’ and ‘individual motivation’, each of which is used to signify a different type of relevant factor. Notably, the factor  $D_i$  corresponds to barriers for organic preferences that are associated with an individual’s general life situation, e.g. insufficient time, money, and education. In this regard, the existence of higher values of this factor suggests that an individual more closely approximates the prototype of an ‘organic consumer’, that is the type of individual whose overall life situation is more compatible with such consumption. In contrast, different values of the ‘motivation’ factor indicate variations in the commitment and energy with which an activity is pursued.<sup>10</sup> The potential to distinguish between demographics and motivation in this fashion allows us to disentangle those determinants of behavior which broadly transact with the retail context from those that do not.

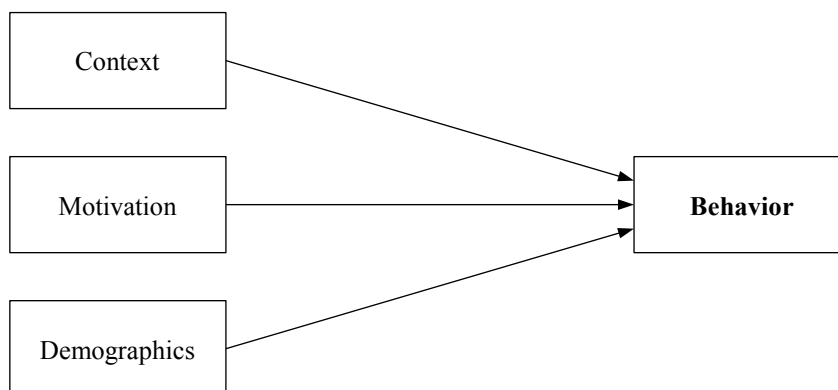
Unlike the two factors  $D_i$  and  $M_i$ , the specific role assigned to the ‘retail format’ depends on the model being considered. Generally speaking, this variable illustrates how the retail format influences the expression and/or development of organic consumer behavior. For instance, regarding the additive model, the straightforward inclusion of all factors is done to signal that each has an independent effect on behavior (see Figure 5.1). Accordingly, this model reflects the consequences of reducing the interaction between contextual and individual factors to null. Equally, the interactional model explores the introduction of more theoretical considerations, denoted by the interaction (or moderation) term between motivation and context ( $M_i * C_i$ ) which can be seen in Figure 5.2. This term indicates that the format *only* influences motivation by providing the conditions for behavior to occur. As such, the characteristics of the format crucially establish the likelihood of motivation being expressed in behavior – or conversely motivation being thwarted. Moreover, this modeling structure fosters the distinction between two of the three sources of motivation described earlier: a motivational component which impacts behavior independent of any assistance

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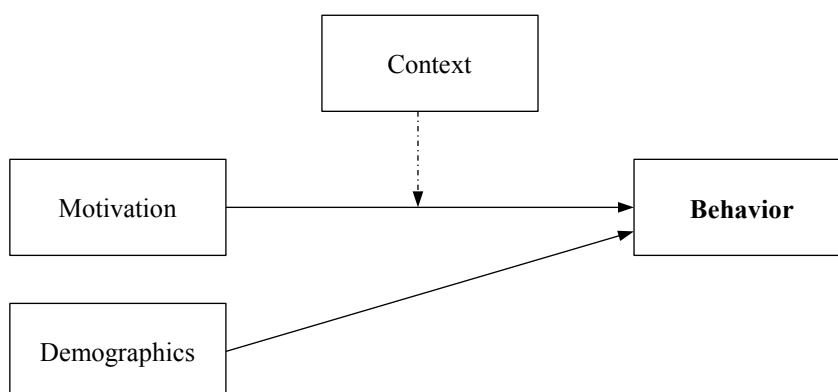
<sup>9</sup> The values of three independent variables range from 1 and 7, modeled in this fashion to broadly correspond to Likert-scale variables. Due to having the same scale, it is also easier to analyze the relationships between them. Further information about the modeling procedure and distributions of the variables is available upon request.

<sup>10</sup> This variable combines capabilities and motivation together in a single factor, reflecting the importance of being both motivated and efficacious when acting. While done partly for the sake of simplicity, factors that combine skill and motivation together are not unfamiliar in the literature on pro-environmental behavior (Corral-Verdugo, 2002).

from the context:  $M_i$ ; and another that benefits from the greater availability and convenience:  $M_i * C_i$ .



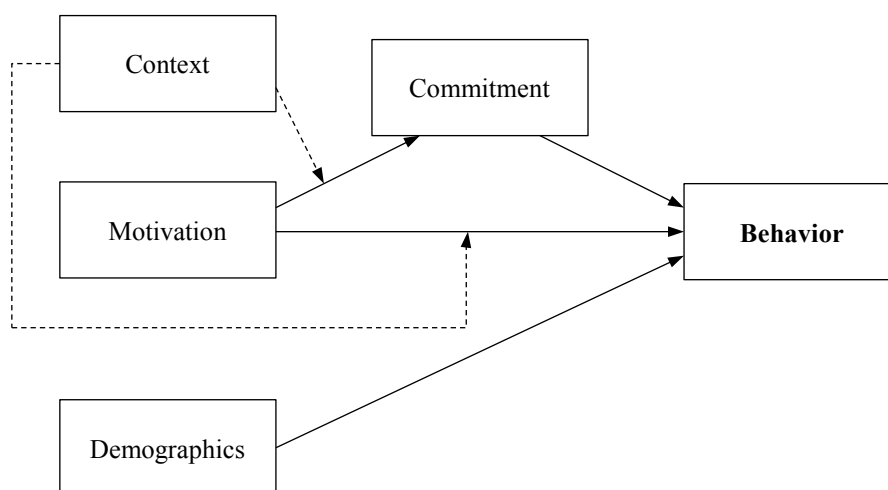
**Figure 5.1: Additive model**



**Figure 5.2: Interactional model**

As one potential shortcoming of this approach, however, it remains difficult to determine if the context itself has any further impact on the quantity and/or quality of individual motivation. For this reason, the transactional model makes use of further theoretical assumptions to depict a richer relationship between retail formats and organic consumption (see Figure 5.3). Notably, this specification introduces the mediation term  $CMT_i$  to designate another mechanism through

which motivation impacts behavior (e.g. Baron and Kenny, 1986). In specific, this term denotes an individual’s level of passion and commitment for organic consumption, indicating that such commitment emerges from interaction with the retail format. According to this model, whether the factors of motivation and retail format are able to foster a greater degree of commitment on the part of individuals explicitly depends on the nature of the relationship between them. As such, the level of commitment that exists, not to mention its consequent impact on motivation, is the result of not only individual factors but the characteristics of the retail format as well. In this regard, the partial mediation of motivation is useful to facilitate a discussion of the greater diversity of relationships that exist between motivation and retail formats.



**Figure 5.3: Transactional model**

For the purposes of this illustration, moreover, the specific type of mediation utilized to model the interaction between motivation and context ( $CMT_i$ ) represents a ‘moderated mediation’ effect (Muller et al., 2005; Zhao et al., 2010). As a feature of this term, the factor of motivation can be seen to have both an independent effect and an effect strengthened by its interaction with the retail format within the mediation term. While this term might therefore appear to resemble the interactional model, it is stressed that the transactional model is able to consider the wider range of relationships through which higher levels of motivation is developed. Notably, looking at Figures 5.2 and 5.3, it can be seen that the interactional model presents motivation as something that is unlocked

within a particular context – i.e. since the potential for motivation to be fully expressed in terms of behavior is moderated by considerations such as availability and convenience. Meanwhile, the presence of moderated mediation establishes that the influence of individual motivation on organic consumption is a further function of the type of retail format. In addition to the strictly individual source of motivation and the one related to the facilitating role of context, it is demonstrated as a result that there is another which emerges from the nature of the relationship between the two. In more general terms, Muller et al. (2005: 854) explain moderated mediation as what occurs when the effect of the mediating process on the outcome itself depends on the value of a moderator variable. As such, the mediation effect does not necessarily take place for all individuals or all formats but rather exists for only a subset of potential interactions between the two. For our illustration, it is the involvement of certain retail formats which is seen to determine if the relationship between motivation and format results in greater commitment.<sup>11</sup> Given the need to conceptualize the differences in retail formats, it is therefore suggested that a format which encourages consumption vis-à-vis convenience and price alone has a mid-to-lower value such as 3 or 4, whereas one with the potential to influence the quality of motivation has a value closer to the upper threshold of the distribution.<sup>12</sup>

On a final note, for the data-generating process to more closely approximate real-world conditions, there is correlation built into the model between both ‘context’ and ‘demographics’ ( $r = 0.278$  in this modeling exercise) since some retail formats are more likely to be prevalent in some socio-demographic contexts rather than others, and ‘context’ and ‘motivation’ ( $r = 0.337$ ) to reflect the greater likelihood that people high in motivation select an alternative retail format. Modeling such dependencies is found to improve the stability of the DGP in the empirical illustration. In contrast, no correlation is modeled between ‘motivation’ and ‘demographics’ given that these factors are previously specified to be separate from one another.

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<sup>11</sup> There are many other decisions, e.g. whether to set the genuine effect of  $C_i$  in the mediation term  $CMT_i$  equal to 0 or 1, which, although meaningful when interpreting the nature of an effect based on real-world data, are not so important for the purposes of this exercise and, moreover, are more likely to add unnecessary complexity.

<sup>12</sup> The mediation term  $CMT_i$  is modeled with positive skewness, i.e. the data is shifted to the left, which is appropriate given the relative novelty of organic consumption and, as a result, the likelihood that the majority of such relationships, if they exist, are likely to be relatively limited in nature.

## 5.6 Results of the empirical illustration

Given that the fundamental purpose of the empirical illustration is to explore the consequences of using a more limited version of the relationship between motivation and context, this section presents and discusses the results at the same time. Since the transactional model serves as the reference model, the results of this model are more useful to verify whether the illustration has performed as expected. In specific, all variables are found to be statistically significant with coefficient estimates approximately equal to one, which recall represents the genuine effect. Therefore, we proceed by first comparing the additive model against this baseline before considering the difference between the interactional and transactional models.

With the results presented in Table 5.1, it can be seen that the additive model yields large and significant estimates of motivation and context which are equal to 5.93 and 5.02, respectively. Since the genuine effects are equal to 1 and 0, it is therefore demonstrated that the reliance on an additive approach has the potential to greatly exaggerate the effects of interest.<sup>13</sup> The sole exception in this regard is ‘demographics’ ( $D_i$ ), whose estimate is significant and close to 1. In fact, this factor accurately reflects its genuine effect in all three models. However, this is not surprising given how the exercise is constructed. Besides the substantial omitted-variable bias which is present, it can be further noted that the interpretation of the results is flawed with regard to the relationship between behavior and context as well. Notably, another consequence of this model is that the intercept is estimated to equal -15.09 when it should be 0. In part, this is a reflection of the amount of information excluded from the model. Interestingly, however, the fact that this estimate is significantly negative implies that the probability of organic consumption is heavily biased downwards, that is, biased against individuals without intrinsic motivation and/or who do not frequent an alternative store format.

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<sup>13</sup> A variety of other modeling frameworks were attempted, particularly with regards to the retail format. However, there was very little, if any, impact on the results. For instance, setting the genuine effect of ‘format’ equal to 1 in the transactional model only causes the corresponding estimate in the additive model to increase to around 6. As such, the size of the omitted-variable bias remains the same. The same also holds true regarding the specification of the mediating term.



**Table 5.1: Results of the modeling exercise**

|                            | Estimate  | SE    | T-value |
|----------------------------|-----------|-------|---------|
| <b>Additive Model</b>      |           |       |         |
| (Intercept)                | -15.09*** | 0.313 | -48.23  |
| $D_i$                      | 0.99***   | 0.051 | 19.54   |
| $M_i$                      | 5.93***   | 0.054 | 110.59  |
| $C_i$                      | 5.02***   | 0.065 | 76.73   |
| <b>Interactional Model</b> |           |       |         |
| (Intercept)                | -0.14     | 0.400 | -0.36   |
| $D_i$                      | 1.00***   | 0.030 | 32.82   |
| $M_i$                      | 2.04***   | 0.098 | 20.89   |
| $C_i$                      | 1.06***   | 0.102 | 10.42   |
| $M_i * C_i$                | 0.99***   | 0.023 | 42.25   |
| <b>Transactional Model</b> |           |       |         |
| (Intercept)                | 0.11      | 0.288 | 0.37    |
| $D_i$                      | 0.98***   | 0.022 | 44.98   |
| $M_i$                      | 0.94***   | 0.078 | 12.02   |
| $C_i$                      | -0.01     | 0.081 | -0.09   |
| $CMT_i$                    | 1.01***   | 0.033 | 30.76   |
| $M_i * C_i$                | -0.01     | 0.036 | -0.19   |
| <b>CMT Regression</b>      |           |       |         |
| (Intercept)                | -0.20     | 0.269 | -0.73   |
| $M_i$                      | 1.08***   | 0.067 | 16.07   |
| $C_i$                      | 1.06***   | 0.069 | 15.23   |
| $M_i * C_i$                | 0.98***   | 0.016 | 60.92   |

Notes: \*\*\*  $p < .001$ ;  $D_i$  = Socio-demographic characteristics;  $M_i$  = Individual motivation;  $C_i$  = Context (retail format);  $CMT_i$  = Commitment;  $SE$  = standard error.

In sum, the results of the additive model demonstrate the existence of a strong bias against organic consumption unless particular individual and contextual factors exist. It is intriguing to extrapolate, consequently, how the interpretation of organic consumption which results from such a model would portray it as the domain of altruistic and ideologically unique individuals. In this respect, it would not be surprising for research to thus be broadly devoted to identifying factors that are correlated with a greater likelihood of consumption. In short, the performance of this model can be summarized to illustrate the perils of completely neglecting the relationship between retail formats and individual motivations.

Looking at the results, it is readily apparent that the interactional model is able to better capture the underlying impact of the determinants on organic consumption. Notably, as a consequence of using moderation to characterize the relationship between context and behavior, the estimates of individual motivation and context decrease to 2.04 and 1.06, respectively. This represents a manifold correction to

the problem of omitted-variable bias: First, it can be concluded that the inclusion of any type of ‘relational factor’ in the model promotes substantial improvement in the fit of the model by accounting for much of the unexplained heterogeneity. In addition, the estimates of motivation and retail format as separate components are also drastically reduced in their value, while remaining significant. Finally, notice how the intercept is no longer significant, indicating that it is not only the most committed and passionate of individuals that engage in organic consumption.

The improvement of this model is in fact so substantial that the difference between the interactional and transactional models becomes quite subtle, especially were we not sure that the transactional model represents the ‘true’ model. Regarding the size and significance of the coefficient estimates, the only notable disparity is that the estimate of  $M_i$  is doubled in the interactional model. In contrast, the coefficients of both context (retail format) and the interaction term  $M_i * C_i$  are nearly identical to those in the *CMT* regression. Hence, the consequences of model misspecification in this case are less abrupt with the ‘true’ effect of the variables not over-estimated but rather re-directed through distinct channels.

In this regard, however, the subtlety of the differences that exists reveals the difficulty of only looking at coefficient estimates to adjudge model performance. In particular, it is vital to recall that the results that are obtained from such models broadly establish the research agenda which is then widely applied for policy purposes. In contrast to the supposedly limited impact of using certain models, the reliance on additive models, for instance, establishes that the type of retail format matters, though ultimately explaining this result in terms of ‘store effects’. At the same time, the exaggerated importance assigned to individual motivation in such models provides the rationale for behavioral interventions which seek to foster change in the attitudes and values of individuals to more closely resemble the prototype of an ‘organic consumer’. Hence, the policy implications which are delivered are reliant on the type of modeling framework, which itself depends on the understanding of the relationship between individual and context.

Consequently, in relation to the interactional model, its impact on policy implications becomes apparent when noting how the understood role of the retail format seems to change, that is, even though effect sizes are similar. Notably, when the estimate of context ( $C_i$ ) in the interactional model ( $\beta = 1.06$ ) is compared with that in the mediation term of *CMT*<sub>*i*</sub> ( $\beta = 1.06$ ), no difference can be remarked. Nonetheless, the consequence of using the interactional model is

that individual motivation which actually results from the nature of the relationship between individual and context (recall Figure 5.3) instead seems to result from context alone. In other words, when this motivation cannot be expressed through the mediating term  $CMT_i$ , its weight is instead re-directed with significant changes in how the results are interpreted. In contrast, when the full complexity of the relationship between individual and context (retail format) is modeled through the inclusion of  $CMT_i$ , we see how  $C_i$  becomes non-significant. Similarly, the estimate of  $M_i$  declines to less than half its size in the interactional model ( $\beta = 0.94$ ), while the interaction term ( $M_i * C_i$ ) becomes insignificantly different from zero. The implications which would be drawn in accordance with the results of the different models to better understand organic consumption therefore change drastically.

## 5.7 Improving the reality of descriptions of organic consumption

After describing and discussing the results of the empirical illustration, this section now proceeds by integrating the knowledge acquired from researching organic consumption. In this respect, the implications that can be drawn from the modeling exercise show how the reality of descriptions of organic consumption can be much improved. Accordingly, this section talks about the distinct relevance of interactional and transactional models for predicting consumer behavior, while also connecting them to broader theoretical considerations of how environmental and ethical consumption can be explained and predicted. In addition, by pointing out issues which must be recognized in this regard, this section identifies gaps in the literature regarding the relationship between retail formats and consumer behavior. The section closes with a description of some examples of valuable estimation techniques that have been used in a few existing studies to capture the different ways that context influences organic consumption.

With regards to pro-environmental behaviors like organic consumption, as mentioned already in Section 5.3, it should be emphasized that systematic research of contextual factors is still somewhat lacking in this context and must be expanded, especially since the focus of environmental psychology lies on exploring the transactions between individuals and their surroundings (Steg and Vlek, 2009). In this respect, as shown by the modeling exercise conducted in this

chapter, both interactional and transactional models signify viable options to better reflect the importance of the context for individual behavior. Moreover, the differences between the two models are more broadly significant for the fact that they correspond to the distinct sides of the debate regarding how to improve the reality of descriptions of organic consumption. Notably, recall that one strategy (implicitly) argues for maintaining existing modeling frameworks while enriching the sets of individual and contextual factors with new determinants, while the other emphasizes the necessity of reconsidering how the relationship between individual behavior and retail format is modeled.

In order to facilitate this discussion, it is helpful to see how the two viewpoints are represented. Notably, seeming to support the former, Stern (2000: 418) argues that the possibility of attaining a better understanding of environmental and ethical behavior requires “synthetic theories or models that incorporate variables from more than one of the above broad classes [of individual and contextual factors], postulate relationships among them, and use them to explain one or more types of environmentally significant behavior.” In other words, the potential to cultivate a richer explanation of consumer behavior from this perspective is seen to demand not the reduction of boundaries between individual and contextual factors but instead, leaving them in place and grafting further explanations on top of an already existing framework. However, given the fact that behavioral change is only progressing for a minority of consumers in spite of the broad familiarity with sustainable consumption, Brown (2002) points out that it should be asked if past research even explored the right questions. Regarding the apparent association between alternative retail formats and differences in energy and passion across consumers, it is important to explore the foundations for those variations among consumers – rather than just asking if said association exists. In this respect, it can be argued that a fuller understanding of the sources of motivation is required. That is, explanations relying only on individual factors should be supplemented by a greater consideration of the nature of the relationship between retail formats and consumer behavior.

Nonetheless, though interactional models used to predict consumer behavior do offer improved performance in comparison with to their additive counterparts, it is not necessarily easier to explain how this particular ‘characteristic’ emerges. Instead, due to the enduring emphasis on individual factors in this model, the importance of the retail format continues to be expressed in relation to whether or not it fulfills its prescribed role of providing cheap and convenient access to organic products. Nevertheless, this indicates that the potential significance of the

relationships between the consumers and places involved in food production are overlooked. In this regard, it is somewhat predictable that the retail format is said to represent, for example, “a critical variable in explaining purchases of organic produce *so long as organic products persist in not being regularly available in most mainstream supermarkets*” (Thompson, 1998: 1116, *emphasis added*). In other words, the expiration date of their relevance is tied to such products being widely available. Furthermore, even when it is determined that the retail context matters, the only possible conclusion according to Zepeda and Li (2007) is that a greater availability of organic produce in conventional food stores would stimulate a further increase in demand. Such a statement, however, is more or less tautological given that availability and context, at least as defined in this situation, are more or less synonymous. Parenthetically, it is informative in this regard that Zepeda and Li (2007) have difficulty fully explaining the behavior of the most passionate organic consumers.

Hence, rather than dismissing the passion of committed individuals and (re-)emergence of alternative retail formats as peripheral considerations for understanding organic consumption, it is plausible that the lingering presence of such unexplained variables indicates a consequence of continuing to rely on existing models to explain consumer behavior even when their shortcomings become more apparent. In this regard, if the general expectation exists that the effect size of the retail context within statistical models is of a certain magnitude and direction, it might be asked what sort of evidence could be provided to illustrate that this framework is fallacious, given how this expectation is ultimately reinforced. In fact, the clearest indication seems actually to be that such puzzles exist. Accordingly, it can be suggested that the validity of a model and its assumptions should not be exclusively evaluated using goodness of fit and/or how well existing expectations are confirmed. Instead, a third criteria reflecting how fully a given model accounts for the range of phenomena in this domain should also be proposed.

In view of the important relationships between both product and context, and context and individual, respectively, the complexities of the organic food industry require particular consideration of the relationship between the retail format and individual motivation. Accordingly, it can be argued that continuing to adapt existing models to provide familiar answers to new questions limits our capacity to explain the relationship between individual and context. Paraphrasing Dewey and Bentley (1949: 141), the need to ‘see things together’ is especially significant when there is a tendency to rely on vague descriptions such as ‘store effects’ that

“insert a name in place of a problem, and let it go at that” rather than providing an explanation to the puzzles that present themselves for consideration. Theoretical discussions regarding moderated mediation have the potential to offer further insight in this regard, specifically concerning direct relations between variables which are difficult to explain, e.g. between retail formats and organic consumption. Notably, Zhao et al. (2010: 199) argue that “the sign of the mysterious “direct” effect has heuristic value for theory building” given that the result likely reflects the omission of one or more mediators in the model. Consequently, the finding that more complex relationships exist between the factors does not represent a final stop for analysis but rather an indication that further theorizing is required about potential mediators.

In a similar fashion, when modeling the relation between retail formats and consumer behavior, consideration must be given to not only the type of format but also the specific features that make it relevant for organic consumption. Thus, it is vital to weigh up other types of estimation techniques which might be able to better capture the difficult-to-model aspects of context. For instance, though only concentrating on aspects such as price and convenience, Hsieh and Stiegert (2012) are able to enrich the understanding of the interactions between organic food and store characteristics by linking variations in consumer loyalty and willingness to pay to specific formats. Another possibility in this regard is the method of stochastic frontier analysis which has proven particularly useful in mitigating the omitted-variable bias that comes from failing to consider difficult-to-model contextual aspects (Carriazo et al., 2013). Mixed-effects models have also been shown to capture the significant place-to-place variation in pro-environmental behavior which results from the changes in social and physical environments, whether small or large (Hamilton et al., 2010). In particular, both approaches – stochastic frontier analysis and mixed-effects models – have the greater emphasis on explaining the residual variation in common, which is left unaccounted when taking a ‘limited context’ perspective. Regarding the relationship between context and behavior, especially mixed-effects models have the potential to depict individual behavior as nested within specific contexts, and thereby reflect the more constitutive nature of this relationship.

## 5.8 Conclusions

The empirical illustration at the center of this chapter expresses the importance of taking into account how the quality of individual motivation potentially changes as a result of the dynamic and ongoing interaction of an individual with a specific context. Not only a question of ‘getting the conditions right’ for organic consumption to occur, it is demonstrated that modeling the full complexity of the relationship between individual and context requires the use of more complicated frameworks. In this particular exercise, the use of a mediation term is thereby able to facilitate the distinction between: (1) individuals that have an inherently higher level of motivation to consume organic food, perhaps due to certain values or the pressure from perceived social norms; (2) those that seek to consume more as it becomes cheaper, easier, and more convenient; and (3) individuals that find increased motivation through their ongoing engagement with specific types of formats that allow them to further develop their preferences. Consequently, the additional complexity of a model, if founded solidly in theory, is able to illustrate both the greater richness of the retail-consumer relationship and the diverse sources of individual motivation. Such complexity can therefore be seen as the price of developing a more integrated view of organic markets and their participants which is necessary to provide a more solid foundation for continued research.

The significance of not making concessions to fit more complex relationships into already existing models is established here using an empirical illustration. To underscore the different types of relationships which are possible, three different sources of motivation are identified using the literature on organic consumption: a strictly individual source of motivation; another emerging from the facilitating role of context; and the increasing quality of motivation which arises from the relationship between individual and retail format. Consequently, the results of the empirical illustration show how only incomplete or partly accurate conclusions can be drawn from the use of approaches which fail to consider the richer relationships that exist between retail format and motivation. As a result, the awareness that such relationships exist remains insufficient so long as it is not expressed in a suitable modeling approach.

Of course, it must be admitted that this straightforward exercise is not able to evaluate how the various models perform more deeply. For instance, regarding the relative performance of the interactional and transactional models, it cannot be determined if the direct effect of individual motivation on consumer behavior (i.e.

the moderation term in the interactional model,  $M_i * C_i$ ) is more impactful than the effect which emerges from the link between motivation and context (i.e. the mediation term in the transactional model,  $CMT_i$ ). In the future, a more elaborate illustration could be developed for such a purpose involving more than three variables, and perhaps integrating dynamics as well. Further, the use of a data-generating process distinct from the models which are analyzed would also represent a significant improvement.

More generally, following Dewey and Bentley (1949), the principal consequence of this chapter for the literature on organic consumption relates to the importance of understanding how things fit together before endeavoring to take them apart to explore specific problems in greater detail. Considering the relationship between retail formats and consumer behavior therefore represents a central feature of model selection. Accordingly, it is only advisable to reduce the complexity of the model when the nature of this relationship is sufficiently clear. For this reason, this chapter underscores that the types of retail formats easily available to consumers represent an important consideration for organic consumption – and one demanding greater policy attention. Beyond informational and structural strategies that focus on the economic and cognitive aspects of decision-making (Gardner and Stern, 1996; Steg and Vlek, 2009), more contextual strategies such as enriching the diversity of retail formats and facilitating a broader understanding of how they are relevant must therefore be considered. Given the possible impact from promoting a more narrow relationship between individuals and context, moreover, the increasing reliance on ‘nudging’ to foster more sustainable behavior could actually adversely impact individual motivation, that is rather than singularly improving decisions and their outcomes.

Finally, it is suggested for future research that the use of retail-consumer dyads could signify the foundation through which novel empirical methods and theoretical insights, e.g. from self-determination theory (Ryan and Deci, 2000) and regulatory fit theory (Higgins, 1997, 2000), might be used to explore how organic preferences are influenced by the level of support offered by the retail context. Such a relational approach seems especially relevant for attempts to model how differences between types of retail formats are relevant for some consumers having more energy and motivation to purchase organic food in specific and for the task of improving what is known about the domain of organic consumption more generally.



## Chapter 6

### Summary and Contribution

As we gradually come to terms with the every-day realities of climate change and environmental degradation, the importance of undertaking, and what is more, realizing transitions towards more sustainable societies is becoming evident. Nowhere is the need for transformation more apparent than in the food industries of wealthy industrialized nations. With each passing day, the appreciation increases of the hidden costs that are entailed with the widespread use of large-scale industrial methods to produce the food that finds its way to our tables. Regarding the many challenges which can be mentioned in this vein, two distinct categories can be clearly discerned. In the first place, there are objectives which have only become recently prominent, such as for instance sustainability and farmer poverty. Owing to their novelty, these issues are in part seen to represent the adverse, unintended consequences of the historical development of industrial food production. In view of the resulting shift which is taking place in relation to what is required of food production in modern societies, it is consequently apparent how the awareness of such consequences is fostering a substantial change in the function that this regime is expected to fulfill for societal progress. Belonging to the second category of challenges that exist, there are those objectives such as health, nutrition and food safety which have long featured in discussions of food production, but now re-emerge in a new form. In this respect, fast-developing concerns related to the widespread application of pesticides in the case of health, and the appearance of novel foodborne illnesses with severe consequences such as mad-cow-disease and foot-and-mouth-disease in the case of food safety illustrate how understandings of food quality are coming to be re-defined.

In spite of their differences, both categories of salient challenges can be seen as different expressions of the fundamental shift in the relationship between the dominant regime and the broader societal context. In view of the changing climate

of food production, pursuing transformation in the food industry is seen to require a significant reconsideration of existing expectations of food quality. Reflecting the more general example of sustainability transitions, discussions of this specific type of transformation are thus characterized by a multitude of viewpoints with regards to what is now expected of food production, and in a related fashion how transformation is to be realized. In this regard, the pursuit of sustainability transitions can be seen to carry substantial implications for the implicit meanings of consumption activities as well. In the specific case of food production, transitions for instance entail the growing significance of a range of ethical and environmental considerations with which products have become invested. Since individuals can thereby play a vital role in broader processes of transformation, it is necessary to contemplate the changing foundations of consumption behavior – represented in the case of the food industry in the evolving relationship between individuals and the food they eat.

For this reason, each of the four main chapters of this dissertation utilizes insights related to individual behavior and its determinants to provide greater depth to discussions of sustainability transitions. In specific, the absence of such an actor-level perspective in the transitions literature – and for descriptions of sustainable behavior more generally – is reflected by the number of puzzles which present themselves for consideration. Consequently, the chapters in this dissertation are broadly motivated to deliver novel insights that help resolve a number of shortcomings throughout the respective literatures and, on this basis, to inform the dialogue of what is required for transitions on firmer ground. In relation to the more general pursuit of sustainability transitions, whether concerning the food industry or any other sector, the entire dissertation specifically contributes to an improved understanding in a number of different respects.

Since the different chapters broadly accord with two distinct strands of contributions, a short summary is necessary to explore the main insights of each chapter and to further elaborate on their particular contribution. Encompassing Chapters 2 and 3, the principal aim of the first broad strand of the dissertation relates to the re-envisioning of the approach of sustainability transitions. This task is undertaken for two particular reasons: first, to better understand the types of determinants that potentially forestall or facilitate transformation in food industry; and second, as a variation on this point, to explicitly highlight the role of individuals within transitions. It is further underscored in the latter regard that, given that instances of transformation are indistinguishable from behavioral change when individuals are taken as the focus of analysis, it is necessary to

consider what is required in terms of for instance the establishment of new knowledge or habits in order to reinforce the broader developments which are in progress.

Starting in a broadly conceptual manner, Chapter 2 establishes the advantages of using a behavior-informed approach to understand and guide transitions seeking to lower the overall environmental impact of society. The aim in this regard is to inform the more systems-oriented research of sustainability transitions by integrating individual-level determinants of environmentally-relevant behavior from the fields of economics, psychology, and sociology. By taking the behavior of individuals – or groups of individuals – as the focus of this analysis, it is argued to be possible to explore the relevance of a wider range of determinants of behavior operating at a number of contextual levels. In addition, this approach is shown to be able to more clearly reflect the complexity of the relationship that exists between individual behavior and the multiple levels of context framing its expression. By further developing the existing framework, this chapter makes the specific contribution of expanding the toolbox of sustainability transitions research through the identification of a more diverse set of pathways by which behavioral change can be pursued.

Representing a more focused look at the broader foundations for transformation, Chapter 3 then considers how the difficulty of addressing a number of problems related to industrial food production is calling into question the relevance of this regime for modern societies. In view of the uncertainty surrounding transformation(s) in the food industry, the approach of historically-informed systems analysis is used to establish the relationship between industrial food production and the salient problems confronting the American food industry in the 21<sup>st</sup> century. Profiting from the use of a problem-oriented understanding of regimes, it is illustrated on the one hand how many presumptions about industrial food production are revealed to be somewhat misleading once seen in the light of this regime's initial emergence. Moreover, through the illumination of the historical context in which this regime initially emerged, it is clarified that the inherent difficulty of tackling problems like environmental degradation and food safety directly results from their connection with the evolved structure of industrial food production in the United States. In this regard, the notion of persistent problems (Schuitmaker, 2012) is used to explore how this regime is itself broadly responsible for the problems that exist owing to its continued reliance on the historically-established success factors of scale production, scientific expertise, and standardization. As a result, if we wish to tackle the

problems confronting food production, it is necessary to entertain the possibility of a new regime, notably one whose structure is not as entangled with a variety of problems, and/or a new set of success factors. Making use of the insights of the historically-informed systems analysis, three fundamental conditions for transformation in the food industry are identified in order to establish such discussions on more solid ground.

With this last chapter having highlighted the importance of considering the manner in which novel quality expectations are founded at the heart of regimes, the second broad strand of the dissertation, comprising Chapters 4 and 5, seeks to contribute to a better understanding of the relationship between retail formats and sustainable consumers. In specific, the attention to the distinct aspects of such relationships is seen to offer a considered glimpse into the inner working of regimes, especially regarding the connections that constitute them – a common ground which must be established in order for transformation to take place. In other words, if it is the case that sustainability transitions establish a different set of relations between a given economic sector and the broader society, or for that matter between society and nature more generally, it is vital to contemplate how this emergent relationship comes to be expressed in relation to the decisions and lives of actual individuals.

For this reason, Chapter 4 specifically explores the relationship between different types of retail formats and sustainable consumption in the context of the food industry. Though demand for sustainable food has grown substantially in recent years, this growth occurs unevenly across consumers (Padel and Foster, 2005; Pearson et al., 2011). For exploring preference heterogeneity in organic and ethical consumption, stated-preference methods represent some of the most popular approaches given their ability to consider the broader potential for individuals to engage in such behaviors. In the related approach of discrete choice experiments, participants are presented with sets of choice tasks where they are asked to choose among products composed of distinct attributes. In particular, this method is utilized to understand how and why individuals differ in their willingness to pay (WTP) for qualities like organic, fair trade, and local production. Owing to the focus on product qualities, however, the importance of the retail format where products are actually purchased has typically remained neglected. For this reason, this empirical study utilizes a hypothetical discrete choice experiment with opt-out option to explore how the type of retail format matters for sustainable tomato consumption. The experiment was purposely designed to consider two potential mechanisms through which retail formats

might be relevant. First, in order to explore the possibility that the type of retail format has a direct impact on consumption, three distinct retail formats are represented in the set of choice tasks: discounters, supermarkets, and independent organic retailers. As such, the type of retail format is therefore included as an integral element of purchasing decisions. Second, by allowing for potential interactions between the type of retail format and the various quality attributes, this design makes it possible to explore how where I shop influences what I buy in this manner as well. In sum, the study presented in this chapter is able to conclude that the type of retail format is a significant determinant of sustainable consumption, both on its own, and in interaction with other qualities. Representing a contribution of a more methodological nature, moreover, this study is the first in the sustainable consumption literature to make use of an individually-specified status quo to make choice tasks more reflective of actual decisions. Accordingly, by improving the degree to which the status quo corresponds to the life situations of individuals, it becomes possible to improve the accuracy of the WTP estimates that are derived.

Finally, in order to further establish the importance of the type of retail format, Chapter 5 seeks to elucidate the more complicated and varied relationships that exist between retail formats and individual motivation to consume organic products. In this regard, it is argued that the impact the retail format has on the level of individual motivation is generally overlooked in discussions of organic consumption, owing to the tendency to model individual and contextual factors separately. As a result, the dominant research paradigm, which is (partly) manifested by this tendency, has difficulties accounting for the differences in energy and motivation across consumers – a difficulty further compounded by the insistence on increasing the ‘reality’ of descriptions of consumer behavior by expanding the set of contextual factors. Accordingly, as a thought experiment with respect to explanations of individual motivation for purchasing organic food, this chapter conducts an empirical illustration to explore the consequences of using two prevalent modeling approaches which make use of a limited expression of the relationship between individual and retail format. By showing the potential for omitted variable bias and misleading policy implications, it is established that it is not sufficient to recognize the shortcomings in the literature on organic consumption if this knowledge is not backed up by modeling approaches that can account for the broader range of relationships that exists, as well as the relevance of these relationships to the level of motivation.

Overall, the chapters in this dissertation illustrate the importance of a more behavior-informed view of sustainability transitions. Since the existing literature is broadly dominated by more systems-level perspectives, approaches of this kind are necessary to understand how individual-level processes of behavioral change can either add to or detract from the potential momentum for transitions towards more sustainable societies. For this reason, further research into sustainability transitions can be imagined which more richly considers, for instance, the need for knowledge derived from both the determinants of consumer learning and, simultaneously, the transformative potential of specific types of retail formats.

## 7 References

- Abrahamse, W., Steg, L., Vlek, C., and Rothengatter, T. (2007). The effect of tailored information, goal setting, and tailored feedback on household energy use, energy-related behaviors, and behavioral antecedents. *Journal of Environmental Psychology*, 27: 265–276.
- Adamowicz, W., and Boxall, P. (2001). Future directions of stated choice methods for environment valuation. Paper prepared for: Choice experiments: A new approach to environmental valuation, 04/2001, London.
- Adamowicz, W., Boxall, P., Williams, M., and Louviere, J. J. (1998). Stated preference approaches for measuring passive use values: Choice experiments and contingent valuation. *American Journal of Agricultural Economics*, 80(1): 64–75.
- Adlwarth, W., and Kecskes, R. (2013). Discount goes luxury – Trading up dank ‘Mehrwert’. Consumer Panels, Consumer Index 09/2013, Gesellschaft für Konsumforschung (GfK), Nürnberg. [https://www.gfk.com/de/documents/news%20deutschland/ci\\_09-2013.pdf](https://www.gfk.com/de/documents/news%20deutschland/ci_09-2013.pdf) (accessed 5 July 2014).
- Adlwarth, W., and Kecskes, R. (2014). Nachhaltig oder regional? – Am besten beides. Consumer Panels, Consumer Index 03/2014, Gesellschaft für Konsumforschung (GfK), Nürnberg. [https://www.gfk.com/de/Documents/News%20Deutschland/CI\\_03\\_2014.pdf](https://www.gfk.com/de/Documents/News%20Deutschland/CI_03_2014.pdf) (accessed 5 July 2014).
- Aichele, R., and Felbermayr, G. (2012). Kyoto and the carbon footprint of nations. *Journal of Environmental Economics and Management*, 63: 336–354.
- Akerlof, G. A. (1970). The market for ‘lemons’: Quality, uncertainty, and the market mechanism. *Quarterly Journal of Economics*, 84(3): 488–500.
- Akerlof, G., and Kranton, R. E. (2000). Economics and identity. *Quarterly Journal of Economics*, 115: 715–753.
- Ajzen, I. (1985). From intentions to actions: A theory of planned behavior. In J. Kuhl, and J. Beckmann (Eds.), *Action control: From cognition to behavior*. New York: Springer.
- Ajzen, I. (1991). The theory of planned behavior. *Organizational Behavior and Human Decision Processes*, 50: 179–211.
- Allen, F. (1984). Reputation and product quality. *The RAND Journal of Economics*, 15(3): 311–327.

- Andersen, E. S. (1994). The evolution of credence goods: A transaction approach to product specification and quality control. MAPP working paper 21, Programme on market-based process and product innovation in the food sector. Aarhus: Aarhus School of Business.
- Andersen, E. S., Philipsen, K. (1998). The Evolution of Credence Goods in Customer Markets: Exchanging “Pigs in Pokes,” paper presented at the DRUID Winter Seminar, Middelfart, Denmark, 1998.
- Andreoni, J. (1990). Impure altruism and donations to public goods: A theory of warm-glow giving. *Economic Journal*, 100(401): 464–477.
- Antal, M., Gazheli, A., and van den Bergh, J. C. J. M. (2012). Behavioral foundations of sustainability transitions. *WWWforEurope Working Paper Series no. 3*, Vienna.
- Antal, M., and van den Bergh, J. C. J. M. (2014). Re-spending rebound: A macro-level assessment for OECD countries and emerging economies. *Energy Policy*, 68: 585–590.
- Ariely, D., and Norton, M. I. (2008). How actions create – not just reveal – preferences. *Trends in Cognitive Sciences*, 12(1): 13–16.
- Armitage, C. J., and Conner, M. (1999). The theory of planned behaviour: Assessment of predictive validity and perceived control. *British Journal of Social Psychology*, 38: 35–54.
- Aronson, E., and O’Leary, M. (1983). The relative effectiveness of models and prompts on energy conservation: A field experiment in a shower room. *Journal of Environmental Systems*, 12: 219–224.
- Aronson, E., Wilson, T. D., Akert, R. M., and Fehr, B. (2012). *Social Psychology*. Englewood Cliffs: Prentice Hall.
- Arrow, K., Bolin, B., Constanza, R., Dasgupta, P., Folke, C., Holling, C. S., Jansson, B.-O., Levin, S., Mäler, K.-G., Perrings, C., and Pimentel, D. (1995). Economic growth, carrying capacity, and the environment. *Ecological Economics*, 15: 91–95.
- Arrow, K., Solow, R., Portney, P. R., Learner, E. E., Radner, R., and Schuman, H. (1993). *Report of the US National Oceanic and Atmospheric Administration Panel on contingent valuation*. Washington: Resources for the Future.
- Atkins, P. (2008). Fear of animal foods: A century of zoonotics. *Appetite*, 51(1): 18–21.
- Ayres, N., and Midmore, P. (2009). Consumption of organic foods from a life history perspective: An exploratory study of British consumers. Aberystwyth University (UK), School of Management and Business. [http://orgprints.org/15609/1/Exploring\\_the\\_development\\_of\\_organic\\_consumption\\_in\\_the\\_UK.pdf](http://orgprints.org/15609/1/Exploring_the_development_of_organic_consumption_in_the_UK.pdf) (accessed 21 November 2012).
- Baiocchi, G., Minx, J., and Hubacek, K. (2010). The impact of social factors and consumer behavior on carbon dioxide emissions in the United Kingdom. *Journal of Industrial Ecology*, 14: 50–72.
- Bamberg, S. (2006). Is a residential relocation a good opportunity to change people's travel behavior? Results from a theory-driven intervention study. *Environment and Behavior*, 38(6): 820–840.



- Bamberg, S., and Möser, G. (2007). Twenty years after Hines, Hungerford and Tomera: A new meta-analysis of psycho-social determinants of pro-environmental behaviour *Journal of Environmental Psychology*, 27: 14–25.
- Barański, M., Średnicka-Tober, D., Volakakis, N., Seal, C., Sanderson, R., Stewart, G. B., ... and Leifert, C. (2014). Higher antioxidant and lower cadmium concentrations and lower incidence of pesticide residues in organically grown crops: a systematic literature review and meta-analyses. *British Journal of Nutrition*, 112(5): 794–811.
- Baron, R. M. and Kenny, D. A. (1986). The moderator-mediator variable distinction in social psychological research: Conceptual, strategic, and statistical considerations. *Journal of Personality and Social Psychology*, 51(6): 1173–1182.
- Barr, S. (2006). Environmental action in the home: Investigating the 'value-action' gap. *Geography*, 91(1): 43–54.
- Batie, S. (2008). Wicked problems and applied economics. *American Journal of Agricultural Economics*, 90: 1176–1191.
- Batsell, R. R., and Louviere, J. J. (1991). Experimental analysis of choice. *Marketing Letters*, 2(3): 199–214.
- Baum, C.M., and Gross, C. (2015). Developing Behavior-Informed Strategies for Climate and Sustainability Policy, *mimeo*.
- Baumann, P. (2001). Securing against fraud. In: Proceedings of the European Conference Organic Food and Farming, 05/2001, Copenhagen. [http://www.fvm.dk/kundeupload/konferencer/organic\\_food\\_farming/temaer/theme3.htm](http://www.fvm.dk/kundeupload/konferencer/organic_food_farming/temaer/theme3.htm) (accessed 13 March 2013).
- Bech, M., and Gyrd-Hansen, D. (2005). Effects coding in discrete choice experiments. *Health Economics*, 14(10): 1079–1083.
- Bennett, R. M. (1997). Farm animal welfare and food policy. *Food Policy*, 22: 281–288.
- Bennett, R. M., Anderson, J., and Blaney, R. J. P. (2002). Moral intensity and willingness to pay concerning farm animal welfare issues and the implications for agricultural policy. *Journal of Agricultural and Environmental Ethics*, 15: 187–202.
- Bennett, R. M., and Blaney, R. J. P. (2002). Social consensus, moral intensity and willingness to pay to address a farm animal welfare issue. *Journal of Economic Psychology*, 23: 501–520.
- Bennett, R. M., and Blaney, R. J. P. (2003). Estimating the benefits of farm animal welfare legislation using the contingent valuation method. *Agricultural Economics*, 29: 85–98.
- Berkhout, F., Smith, A., and Stirling, A. (2004). Socio-technological regimes and transition contexts. In B. Elzen, F. W. Geels, and K. Green (Eds.), *System innovation and the transition to sustainability: Theory, evidence and policy* (48–75). Cheltenham: Edward Elgar.
- Bernard, J. C., and Bernard, D. J. (2009). What is it about organic milk? An experimental analysis. *American Journal of Agricultural Economics*, 91(3): 826–836.
- Blake, J. (1999). Overcoming the 'value-action gap' in environmental policy: Tensions between national policy and local experience. *Local Environment*, 4(3): 257–278.

- Bolton, L. E., Cohen, J. B., and Bloom, P. N. (2006). Does marketing products as remedies create “Get out of jail free cards”? *Journal of Consumer Research*, 33(1): 71–81.
- Bond, C. A., Thilmany, D., and Keeling-Bond, J. (2008a). Understanding consumer interest in product and process-based attributes for fresh produce. *Agribusiness*, 24(2): 231–252.
- Bond, C. A., Thilmany, D., and Keeling-Bond, J. (2008b). What to choose? The value of label claims to fresh produce consumers. *Journal of Agricultural and Resource Economics*, 33(3): 402–427.
- Bord, R., O’Connor, R. E., and Fisher, A. (2000). In what sense does the public need to understand global climate change? *Public Understanding of Science*, 9: 205–218.
- Bos, B., and Grin, J. (2008). “Doing” reflexive modernization in pig husbandry: The hard work of changing the course of a river. *Science, Technology, and Human Values*, 33(4): 480–507.
- Bougherara, D., Grolleau, G., and Mzoughi, N. (2009). Buy local, pollute less: What drives households to join a community supported farm? *Ecological Economics*, 68(5): 1488–1495.
- Bouma, J., Van Altvorst, A. C., Eweg, R., Smeets, P. J. A. M., and Van Latesteijn, H. C. (2011). The role of knowledge when studying innovation and the associated wicked sustainability problems in agriculture. In D. L. Sparks (Ed.), *Advances in Agronomy, Vol. 113* (283–312). Burlington: Academic Press.
- Bourn, D., and Prescott, J. (2002). A comparison of the nutritional value, sensory qualities, and food safety of organically and conventionally produced foods. *Critical Review of Food Science and Nutrition*, 42: 1–34.
- Bowles, S. (2008). Policies designed for self-interested citizens may undermine ‘the moral sentiments’: Evidence from economic experiments. *Science*, 320(5883), 1605–1609.
- Bowles, S., and Polania-Reyes, S. (2012). Economic incentives and social preferences: Substitutes or complements? *Journal of Economic Literature*, 50(2): 368–425.
- Brandt, K., Leifert, C., Sanderson, R., and Seal, C. J. (2011). Agroecosystem management and nutritional quality of plant foods: The case of organic fruits and vegetables. *Critical Reviews in Plant Sciences*, 30: 177–197.
- Bratt, C. (1999). Consumers' environmental behavior: Generalized, sector-based, or compensatory? *Environment and Behavior*, 31(1): 28–44.
- Brencic, V., and Young, D. (2009). Time-saving innovations, time allocation, and energy use: Evidence from Canadian households. *Ecological Economics*, 68: 2859–2867.
- Brons, M., Nijkamp, P., Pels, E., and Rietveld, P. (2008). A meta-analysis of the price elasticity of gasoline demand. A SUR approach. *Energy Economics*, 30: 2105–2122.
- Brown, A. (2002). Farmers' market research 1940–2000: An inventory and review. *American Journal of Alternative Agriculture*, 17: 167–176.
- Brown, C., and Miller, S. (2008). The impacts of local markets: A review of research on farmers markets and community supported agriculture (CSA). *American Journal of Agricultural Economics*, 90(5): 1296–1302.

- Burkholder, J., Libra, B., Weyer, P., Heathcote, S., Kolpin, D., Thorne, P. S., and Wichman, M. (2007). Impacts of waste from concentrated animal feeding operations on water quality. *Environmental Health Perspectives*, 115(2): 308–312.
- Busch, L., and Bain, C. (2004). New! Improved? The transformation of the global agrifood system. *Journal of Rural Sociology*, 69: 321–346.
- Canning, P. (2011). A revised and expanded food dollar series: A better understanding of our food costs. Economic Research Report-114, USDA Economic Research Service. <http://www.ers.usda.gov/Publications/ERR114/ERR114.pdf> (accessed 10 May 2011).
- Cardenas, J.-C., Stranlund, J., and Willis, C. (2000). Local environmental control and institutional crowding-out. *World Development*, 28(10): 1719–1733.
- Carpio, C. E., and Isengildina-Massa, O. (2009). Consumer willingness to pay for locally grown products: The case of South Carolina. *Agribusiness*, 25(3): 412–426.
- Carriazo, F., Ready, R., and Shortle, J. (2013). Using stochastic frontier models to mitigate omitted variable bias in hedonic pricing models: A case study for air quality in Bogotá, Colombia. *Ecological Economics*, 91: 80–88.
- Carroll, C. D. (2000). Solving consumption models with multiplicative habits. *Economics Letters*, 68: 67–77.
- Carrus, G., Passafaro, P., and Bonnes, M. (2008). Emotions, habits and rational choices in ecological behaviours: The case of recycling and use of public transportation. *Journal of Environmental Psychology*, 28: 51–62.
- Carson, R. T. (2000). Contingent valuation: A user's guide. *Environmental Science and Technology*, 34: 1413–1418.
- Carson, R. T., Louviere, J. J., Anderson, D. A., Arabie, P., Bunch, D. S., Hensher, D. A., ... and Wiley, J. B. (1994). Experimental analysis of choice. *Marketing Letters*, 5(4): 351–367.
- Caswell, J. A., and Mojduszka, E. M. (1996). Using informational labeling to influence the market for quality in food products. *American Journal of Agricultural Economics*, 78: 1248–1253.
- Caswell, J. A., and Padberg, D. I. (1992). Toward a more comprehensive theory for food labels. *American Journal of Agricultural Economics*, 74: 460–468.
- CDC (2011). 2011 estimates of foodborne illness in the United States. Atlanta: Centers for Disease Control and Prevention (CDC). <http://www.cdc.gov/Features/dsFoodborneEstimates/> (accessed 5 May 2014).
- CDC (2013). FoodNet progress report for 2013 – Trends in foodborne illness in the United States, 2013. Atlanta: Centers for Disease Control and Prevention (CDC). <http://www.cdc.gov/features/dsfoodsafetyreport/> (accessed 16 November 2014).
- CDC/NCHS (2014). Health, United States, 2013; Table 64. Atlanta: Centers for Disease Control and Prevention (CDC), and Hyattsville: National Center for Health Statistics (NCHS). [http://www.cdc.gov/nchs/data/13.pdf#064](http://www.cdc.gov/nchs/data/hus/13.pdf#064) (accessed 15 August 2014).

- Chalkley, A. M., Billett, E., and Harrison, D. (2001). An investigation of the possible extent of the Re-spending Rebound Effect in the sphere of consumer products. *Journal of Sustainable Product Design*, 1: 163–170.
- Chao, E. L., and Utgoff, K. P. (2006). 100 years of US consumer spending: Data for the Nation, New York City, and Boston. Report 991, US Department of Labor and US Bureau of Labor Statistics. <http://www.bls.gov/opub/uscs/report991.pdf> (accessed 13 September 2013).
- Chitnis, M., Sorrell, S., Druckman, A., Firth, S. K., and Jackson, T. (2013). Turning lights into flights: Estimating direct and indirect rebound effects for UK households. *Energy Policy*, 55: 234–250.
- Cialdini, R. B., Demaine, L. J., Sagarin, B. J., Barrett, D. W., Rhoads, K., and Winter, P. L. (2006). Managing social norms for persuasive impact. *Social Influence*, 1(1): 3–15.
- Cialdini, R. B., Kallgren, C. A., and Reno, R. R. (1991). A focus theory of normative conduct: A theoretical refinement and reevaluation of the role of norms in human behavior. *Advances in Experimental Social Psychology*, 24: 201–234.
- Cialdini, R. B., Reno, R. R., and Kallgren, C. A. (1990). A focus theory of normative conduct: Recycling the concept of norms to reduce littering in public places. *Journal of Personality and Social Psychology*, 58: 1015–1026.
- Clarke, S. H. (1994). *Regulation and the revolution in United States farm productivity*. Cambridge: Cambridge University Press.
- Clauson, A. (2014). Table 7 – Food expenditures by families and individuals as a share of disposable personal income. ERS Food Expenditure Series. USDA Economic Research Service. [http://www.ers.usda.gov/data-products/food-expenditures.aspx#.UheiYpLvj\\_I](http://www.ers.usda.gov/data-products/food-expenditures.aspx#.UheiYpLvj_I) (accessed 10 February 2015).
- Collins, E. (1993). Food adulteration and food safety in Britain in the 19<sup>th</sup> and early 20<sup>th</sup> centuries. *Food Policy*, 18(2): 95–109.
- Conkin, P. (2008). *A revolution down on the farm: The transformation of American agriculture since 1929*. Lexington: University Press of Kentucky.
- Conner, M., and Armitage, C. J. (1998). Theory of planned behavior: A review and avenues for further research. *Journal of Applied Social Psychology*, 28: 1429–1464.
- Cooter, R., and Fulton, R. (2001). Food matters: Food safety research in the UK public sector, 1917-1990. *Food Industry Journal*, 4(3): 251–261.
- Corral-Verdugo, V. (2002). A structural model of proenvironmental competency. *Environment and Behavior*, 34(4): 531–549.
- Costa, A. I., and Jongen, W. M. F. (2006). New insights into consumer-led food product development. *Trends in Food Science and Technology*, 17(8): 457–465.
- Costanigro, M., Thilmany McFadden, D., Kroll, S., and Nurse, G. (2011). An in-store valuation of local and organic apples: The role of social desirability. *Agribusiness*, 27(4): 465–477.
- Council of Economic Advisors (2006). *Economic Report of the President*. Washington: United States Government Printing Office. <http://www.gpo.gov/fdsys/pkg/ERP-2006/pdf/ERP-2006.pdf> (accessed 25 February 2015).

- Csikszentmihalyi, M. (2000). The costs and benefits of consuming. *Journal of Consumer Research*, 27: 267–272.
- Csutora, M. (2012). One more awareness gap? The behaviour–impact gap problem. *Journal of Consumer Policy*, 35: 145–163.
- Darby, K., Batte, M. T., Ernst, S., and Roe, B. (2008). Decomposing local: A conjoint analysis of locally produced foods. *American Journal of Agricultural Economics*, 90(2): 476–486.
- Darby, M. R., and Karni, E. (1973). Free competition and the optimal amount of fraud. *Journal of Law and Economics*, 16: 67–88.
- Dasgupta, S., Laplante, B., Wang, H., and Wheeler, D. (2002). Confronting the Environmental Kuznets Curve. *Journal of Economic Perspectives*, 16(1): 147–168.
- De Boer, J., Boersema, J. J., and Aiking, H. (2009). Consumers' motivational associations favoring free-range meat or less meat. *Ecological Economics*, 68(3): 850–860.
- De Bruijn, G. J., Kremers, S. P. J., Vet, E., Nuijter, J., Mechelen, W., and Brug, J. (2007). Does habit strength moderate the intention-behaviour relationship in the theory of planned behaviour? The case of fruit consumption. *Psychology and Health*, 22: 899–916.
- Deci, E. L. (1971). Effects of externally mediated rewards on intrinsic motivation. *Journal of Personality and Social Psychology*, 18 (1): 105–115.
- Deci, E. L., Koestner, R., and Ryan, R. M. (1999). A meta-analytic review of experiments examining the effects of extrinsic rewards on intrinsic motivation. *Psychological Bulletin*, 125(6): 627–668.
- Deci, E. L., and Ryan, R. M. (2000). The “what” and “why” of goal pursuits: Human needs and the self-determination of behavior. *Psychological Inquiry*, 4: 227–268.
- De Groot, J. I. M., and Steg, L. (2007). Value orientations and environmental beliefs in five countries: Validity of an instrument to measure egoistic, altruistic and biospheric value orientations. *Journal of Cross-Cultural Psychology*, 38: 318–332.
- Dentoni, D., Tonsor, G. T., Calantone, R. J., and Peterson, H. C. (2009). The direct and indirect effects of 'locally grown' on consumers' attitudes towards agri-food products. *Agricultural and Resource Economics Review*, 38(3): 384–396.
- De Pelsmacker, P., Driesen, L., and Rayp, G. (2005). Do consumers care about ethics? Willingness to pay for Fair-Trade coffee. *Journal of Consumer Affairs*, 39(2): 363–385.
- DeSimone, L. A., McMahon, P. B., and Rosen, M. R. (2014). *The quality of our Nation's waters: Water quality in principal aquifers of the United States, 1991–2010: U.S. Geological Survey Circular 1360*. Reston: U.S. Geological Survey.
- Devetter, F.-X., and Rousseau, S. (2011). Working hours and sustainable development. *Review of Social Economy*, 69(3): 333–355.
- Dewey, J., and Bentley, A. (1949). *Knowing and the known*. Boston: Beacon Press.
- Diamantopoulos, A., Schlegelmilch, B. B., Sinkovics, R. R., and Bohlen, G. M. (2003). Can socio-demographics still play a role in profiling green consumers? A review of the evidence and an empirical investigation. *Journal of Business Research*, 56(6): 465–480.

- Diekmann, A., and Preisendörfer, P. (1998). Environmental behavior: Discrepancies between aspirations and reality. *Rationality and Society*, 10: 79–102.
- Dietz, T., Gardner, G. T., Gilligan, J., Stern, P. C., and Vandenbergh, M. P. (2009). Household actions can provide a behavioral wedge to rapidly reduce US carbon emissions. *Proceedings of the National Academy of Sciences*, 106(44): 18452–18456.
- Dimitri, C., Effland, A. B., and Conklin, N. C. (2005). *The 20th century transformation of U.S. agriculture and farm policy. Economic Information Bulletin No. 3*. Washington: USDA Economic Research Service.
- Dimitri, C., and Oberholtzer, L. (2009). *Marketing U.S. organic foods: Recent trends from farms to consumers. Economic Information Bulletin No. 58*. Washington: USDA Economic Research Service.
- Dopfer, K., Foster, J., and Potts, J. (2004). Micro-meso-macro. *Journal of Evolutionary Economics*, 14(3): 263–279.
- Dosi, G. (1984). *Technical change and industrial transformation: The theory and an application to the semiconductor industry*. London: Macmillan.
- Druckman, A., Chitnis, M., Sorrell, S., and Jackson, T. (2011). Missing carbon reductions? Exploring rebound and backfire effects in UK households. *Energy Policy*, 39: 3572–3581.
- Druckman, A., and Jackson, T. (2010). The bare necessities: How much household carbon do we really need?. *Ecological Economics*, 69: 1794–1804.
- Dulleck, U., and Kerschbamer, R. (2006). On doctors, mechanics, and computer specialists: The economics of credence goods. *Journal of Economic Literature*, 44(1): 5–42.
- Dulleck, U., Kerschbamer, R., and Sutter, M. (2011). The economics of credence goods: An experiment on the role of liability, verifiability, reputation, and competition. *American Economic Review*, 101(2): 526–55.
- Eagly, A. H., and Chaiken, S. (1993). *The psychology of attitudes*. Fort Worth: Harcourt Brace Jovanovich.
- Earle, M. D. (1997). Innovation in the food industry. *Trends in Food Science and Technology*, 8(5): 166–175.
- EEA (2012). *European waters: Assessment of status and pressures*. Copenhagen: European Environment Agency. <http://krw.stowa.nl/Upload/European%20waters%20-%20assessment%20of%20status%20and%20pressures.pdf> (accessed 7 June 2013).
- EFSA (2015). The 2013 European Union report on pesticide residues in food. *EFSA Journal 2015*, 3(3): 1–169.
- Elitzak, H. (1999). Food cost review, 1950–1997. Agricultural Economics Reports. USDA Economic Research Service. <http://ageconsearch.umn.edu/handle/34053> (accessed 10 September 2010).
- Ellickson, P. B. (2015). The evolution of the supermarket industry: From A&P to Walmart. <http://pauellickson.com/SMEvolution.pdf> (accessed 20 April 2015).

- Engel, E. (1857). Die Produktions- und Consumtionsverhältnisse des Königreichs Sachsen. *Zeitschrift des Statistischen Bureaus des Königlich Sächsischen Ministeriums des Inneren*, 8 und 9: 153–182.
- EU-DG SANCO (2007). Monitoring of pesticide residues in products of plant origin in European Union, Norway, Iceland and Liechtenstein: 2005 Report. [http://ec.europa.eu/food/fvo/specialreports/pesticide\\_residues/report\\_2005\\_en.pdf](http://ec.europa.eu/food/fvo/specialreports/pesticide_residues/report_2005_en.pdf) (accessed 7 May 2014).
- Fair Trade (2014). *Strong producers, strong future: Annual Report 2013-14*. Bonn: Fairtrade International. [http://www.fairtrade.net/fileadmin/user\\_upload/content/2009/resources/2013-14\\_AnnualReport\\_FairtradeIntl\\_web.pdf](http://www.fairtrade.net/fileadmin/user_upload/content/2009/resources/2013-14_AnnualReport_FairtradeIntl_web.pdf) (accessed 14 October 2014).
- FAO (2001). *World markets for organic fruit and vegetables: Opportunities for developing countries in the production and export of organic horticultural products*. Rome: FAO/ITC/CTA. <http://www.fao.org/docrep/004/y1669e/y1669e09.htm> (accessed 10 June 2013).
- FAO (2003). *FAO expert consultation on food safety: Science and ethics. FAO Readings in Ethics No. 1*. Rome: Food and Agriculture Organization of the United Nations (FAO). <ftp://ftp.fao.org/docrep/fao/006/J0776E/J0776E00.pdf> (accessed 7 April 2015).
- FAO (2014). *Tomato Production. FAOSTAT Database*. Rome: Food and Agriculture Organization of the United Nation (FAO). <http://faostat3.fao.org/home/E> (accessed 10 July 2014).
- Farmageddon (2011). Documentary by Canty, K. (Director/Producer), and Dewey, P. (Co-Producer). U.S.A.: Kristin Marie Productions, Miranda Productions Inc.
- Festinger, L. (1957). *A theory of cognitive dissonance*. Stanford: Stanford University Press.
- Fielding, K. S., McDonald, R., and Louis, W. R. (2008). Theory of planned behaviour, identity and intentions to engage in environmental activism. *Journal of Environmental Psychology*, 28: 318–326.
- Finkbeiner, P., and Karoff, N. (2014). Food retail properties in Germany 2014: Market trends and investment opportunities. Joint TLG/Bulwiengesa Study. [http://www.tlg.eu/fileadmin/user\\_upload/TLG\\_Food\\_Retail\\_Properties\\_in\\_Germany\\_2014\\_web.pdf](http://www.tlg.eu/fileadmin/user_upload/TLG_Food_Retail_Properties_in_Germany_2014_web.pdf) (accessed 5 July 2014).
- Finkelstein, E. A., Khavjou, O. A., Thompson, H., Trogdon, J. G., Pan, L., Sherry, B., and Dietz, W. (2012). Obesity and severe obesity forecasts through 2030. *American Journal of Preventive Medicine*, 42(6): 563–570.
- Finkelstein, E. A., Trogdon, J. G., Cohen, J. W., and Dietz, W. (2009). Annual medical spending attributable to obesity: Payer- and service-specific estimates. *Health affairs*, 28(5): w822–w831.
- Fischler, C. (1988). Food, self and identity. *Social Science Information*, 27(2): 275–292.
- Fisher, R. J. (1993). Social desirability bias and the validity of indirect questioning. *Journal of Consumer Research*, 20: 303–315.
- Food Marketing Institute (2008). *U.S. grocer shopping trends 2008*. Arlington: Food Marketing Institute.
- Frankfurt, H. G. (1971). Freedom of the will and the concept of a person. *The Journal of Philosophy*, 68: 5–20.

- Freeman, C. (1991). Innovation, changes of techno-economic paradigm and biological analogies in economics. *Revue Economique*, 42(2): 211–232.
- Frey, B. S. (1997). A constitution for knaves crowds out civic virtues. *The Economic Journal*, 107(443): 1043–1053.
- Frey, B. S., and Oberholzer-Gee, F. (1997). The cost of price incentives: An empirical analysis of motivation crowding-out. *American Economic Review*, 87(4): 746–755.
- Food, Inc. (2008). Documentary by Kenner, R. (Director/Writer/Producer), Pearlstein, E. (Writer/Producer), and Roberts, K. (Writer). U.S.A.: Magnolia Pictures, Participant Media, River Road Entertainment.
- Fujii, S., and Gärling, T. (2003). Development of script-based travel mode choice after forced change. *Transportation Research Part F*, 6: 117–124.
- Fujii, S., Gärling, T., and Kitamura, R. (2001). Changes in drivers' perceptions and use of public transport during a freeway closure: Effects of temporary structural change on cooperation in a real-life social dilemma. *Environment and Behavior*, 33: 796–808.
- Galizzi, G., and Venturini, L. (1996). *Economics of Innovation: The case of food industry*. Heidelberg: Physica-Verlag.
- Gallagher, K. S., and Muehlegger, E. (2011). Giving green to get green? Incentives and consumer adoption of hybrid vehicle technology. *Journal of Environmental Economics and Management*, 61: 1–15.
- Gardner, B., and Abraham, C. (2008). Psychological correlates of car use: A meta-analysis. *Transportation Research Part F*, 11: 300–311.
- Gardner, B. L. (2002). *American agriculture in the twentieth century: How it flourished and what it cost*. Cambridge: Harvard University Press.
- Gardner, G. T., and Stern, P. C. (1996). *Environmental problems and human behavior*. Boston: Allyn and Bacon.
- Gardner, G. T., and Stern, P. C. (2008). The short list: The most effective actions U.S. households can take to curb climate change. *Environment*, 50: 12–24.
- Garud, R., Kumaraswamy, A., and Karnoe, P. (2010). Path dependence or path creation. *Journal of Management Studies*, 47(4): 760–774.
- Gatersleben, B., Steg, L., and Vlek, C. (2002). Measurement and determinants of environmentally significant consumer behavior. *Environment and Behavior*, 34(3): 335–362.
- Geels, F. W. (2004). From sectoral systems of innovation to socio-technical systems: Insights about dynamics and change from sociology and institutional theory. *Research Policy*, 33: 897–920.
- Geels, F. W. (2005a). The dynamics of transitions in socio-technical systems: A multi-level analysis of the transition pathway from horse-drawn carriages to automobiles (1860–1930). *Technology Analysis and Strategic Management*, 17(4): 445–476.



- Geels, F. W. (2005b). Co-evolution of technology and society: The transition in water supply and personal hygiene in the Netherlands (1850–1930) – A case study in multi-level perspective. *Technology in Society*, 27(3): 363–397.
- Geels, F. W. (2006). Major system change through stepwise reconfiguration: A multi-level analysis of the transformation of American factory production (1850–1930). *Technology in Society*, 28(4): 445–476.
- Geels, F. W. (2011). The multi-level perspective on sustainability transitions: Responses to seven criticisms. *Environmental Innovation and Societal Transitions*, 1: 24–40.
- Geels, F. W., Schot, J. (2007). Typology of sociotechnical transition pathways, *Research Policy*, 36: 399–417.
- Getz, C., and Shreck, A. (2006). What organic and Fair Trade labels do not tell us: Towards a place-based understanding of certification. *International Journal of Consumer Studies*, 30(5): 490–501.
- Giannakas, K. (2002). Information asymmetries and consumption decisions in organic food product markets. *Canadian Journal of Agricultural Economics*, 50: 35–50.
- Giddens, A. (1984). *The constitution of society: Outline of the theory of structuration*. Berkeley: University of California Press.
- Gifford, R. (2011). The dragons of inaction: Psychological barriers that limit climate change mitigation and adaptation. *American Psychologist*, 66(4): 290–302.
- Gilchrist, M. J., Greko, C., Wallinga, D. B., Beran, G. W., Riley, D. G., and Thorne, P. S. (2007). The potential role of concentrated animal feeding operations in infectious disease epidemics and antibiotic resistance. *Environmental Health Perspectives*, 115(2): 313–316.
- Gillespie, G., Hilchey, D. L., Hinrichs, C. C., and Feenstra, G. (2007). Farmers' markets as keystones in rebuilding local and regional food systems. In C. C. Hinrichs, and T. A. Lyson (Eds.), *Remaking the North American food system: Strategies for Sustainability* (65–83). Lincoln: University of Nebraska Press.
- Gillingham, K., Kotchen, M. J., Rapson, D. S., and Wagner, G. (2013) The rebound effect is overplayed. *Nature*, 493: 475–476.
- Gladwell, M. (2001). The trouble with fries: Fast food is killing us. Can it be fixed?. *The New Yorker*, 5: 52–57.
- Goodland, R., and Anhang, J. (2009). *Livestock and climate change: What if the key actors in climate change were pigs, chickens, and cows?*. Washington: Worldwatch Institute.
- Goodman, D., and Goodman, M. (2001). Sustaining foods: Organic consumption and the socio-ecological imaginary. In M. Cohen, and J. Murphy (Eds.), *Exploring sustainable consumption: Environmental policy and the social sciences* (97–119). Oxford: Elsevier Science.
- Govindasamy, R., and Italia, J. (1999). Predicting willingness-to-pay a premium for organically grown fresh produce. *Journal of Food Distribution Research*, 30: 44–53.

- Gravel, V., Blok, W., Hallmann, E., Carmona-Torres, C., Wang, H., ..., and Van Bruggen, A. H. C. (2010). Differences in N uptake and fruit quality between organically and conventionally grown greenhouse tomatoes. *Agronomy for Sustainable Development*, 20: 797–806.
- Grebitus, C., Lusk, J. L., and Nayga, R. M., Jr. (2013). Effect of distance of transportation on willingness to pay for food. *Journal of Ecological Economics*, 88: 67–75.
- Green, K., and Foster, C. (2005). Give peas a chance: Transformations in food consumption and production systems. *Technological forecasting and social change*, 72(6): 663–679.
- Green, K., Harvey, M., and McMeekin, A. (2003). Transformations in food consumption and production systems. *Journal of Environmental Policy and Planning*, 5(2): 145–163.
- Green, K., Hull, R., McMeekin, A., and Walsh, V. (1999). The construction of the techno-economic: Networks vs. paradigms. *Research Policy*, 28(7): 777–792.
- Green-Demers, I., Pelletier, L. G., and Ménard, S. (1997). The impact of behavioral difficulty on the salience of the association between self-determined motivation and environmental behaviors. *Canadian Journal of Behavioural Science*, 29(3): 157–166.
- Greene, C. R., Dimitri, C., Lin, B. H., McBride, W. D., Oberholtzer, L., and Smith, T. A. (2009). *Emerging issues in the U.S. organic industry. Economic Information Bulletin No. 55*. Washington: USDA Economic Research Service.
- Greene, W. H., and Hensher, D. A. (2003). A latent class model for discrete choice analysis: Contrasts with mixed logit. *Transportation Research Part B: Methodological*, 37(8): 681–698.
- Griffiths, P. (2012). Ethical objections to Fairtrade. *Journal of Business Ethics*, 105(3): 357–373.
- Grin, J., Rotmans, J., and Schot, J. (2010). *Transitions to sustainable development: New directions in the study of long-term transformative change*. Oxford: Routledge.
- Griskevicius, V., Tybur, J. M., and van den Bergh, B. (2010). Going green to be seen: Status, reputation, and conspicuous conservation. *Journal of Personality and Social Psychology*, 98(3): 392–404.
- Gross, C. (2012). Explaining the (non-) causality between energy and economic growth in the U.S. – A multivariate sectoral analysis. *Energy Economics*, 43(2): 489–499.
- GS1 (2006). Expositum-GS1: Europeans and traceability. [http://www.gs1.org/docs/traceability/GS1\\_traceability\\_survey\\_2006\\_results.pdf](http://www.gs1.org/docs/traceability/GS1_traceability_survey_2006_results.pdf) (accessed 5 October 2013).
- Guthman, J. (2002). Commodified meanings, meaningful commodities: Re-thinking production–consumption links through the organic system of provision. *Sociologia Ruralis*, 42(4): 295–311.
- Hamilton, L. C., Colocousis, C. R., and Duncan, C. M. (2010). Place effects on environmental views. *Rural Sociology*, 75(2): 326–347.
- Hardy, A. (2002). Food, hygiene, and the laboratory. A short history of food poisoning in Britain, circa 1850–1950. *Social History of Medicine*, 12(2): 293–311.

- Harland, P., Staats, H., and Wilke, H. A. M. (1999). Explaining pro environmental behavior by personal norms and the theory of planned behavior. *Journal of Applied Social Psychology*, 29: 2505–2528.
- Hartman Group (2010). *Beyond organic and natural 2010, Resolving confusion in marketing food and beverages*. Bellevue: The Hartman Group, Inc. <http://www.hartman-group.com/downloads/beyond-organic-natural-report-overview.pdf> (accessed 8 October 2011).
- Harvey, M., Quilley, S., and Beynon, H. (2002). *Exploring the tomato: Transformations in nature, economy and society*. Cheltenham: Edward Elgar.
- Harris, G. (2009). U.S. food safety no longer improving. *New York Times*, 9/04/2009. [http://www.nytimes.com/2009/04/10/health/policy/10food.html?\\_r=0](http://www.nytimes.com/2009/04/10/health/policy/10food.html?_r=0) (accessed 20 May 2015).
- Heath, Y., and Gifford, R. (2002). Extending the theory of planned behavior: Predicting the use of public transportation. *Journal of Applied Social Psychology*, 32: 2154–2185.
- Heederik, D., Sigsgaard, T., Thorne, P. S., Kline, J. N., Avery, R., Bønløkke, J. H., ... and Merchant, J. A. (2007). Health effects of airborne exposures from concentrated animal feeding operations. *Environmental Health Perspectives*, 115(2): 298–302.
- Henseleit, M., Kubitzki, S., and Teuber, R. (2007). Determinants of consumer preferences for regional food. Paper prepared for presentation at the 105<sup>th</sup> EAAE Seminar ‘International Marketing and International Trade of Quality Food Products’, 03/2007, Bologna.
- Hensher, D. A., and Greene, W. H. (2010). Non-attendance and dual processing of common-metric attributes in choice analysis: A latent class specification. *Empirical Economics*, 39: 413–426.
- Hensher, D. A., Louviere, J. J., and Swait, J. D. (1999). Combining sources of preference data. *Journal of Econometrics*, 89(1–2): 197–221.
- Herrmann, R., Möser, A., and Weber, S. A. (2009). Grocery retailing in Germany: Situation, development and pricing strategies: Diskussionsbeiträge. Zentrum für internationale Entwicklungs- und Umweltforschung, No. 41. <http://www.econstor.eu/bitstream/10419/39806/1/593466845.pdf> (accessed 13 June 2014).
- Hertwich, E. G., and Peters, G. P. (2009). Carbon footprint of nations: A global, trade-linked analysis. *Environmental Science and Technology*, 43(16): 6414–6420.
- Higgins, E. T. (1997). Beyond pleasure and pain. *American Psychologist*, 52(12): 1280–1300.
- Higgins, E. T. (2000). Making a good decision: Value from fit. *American Psychologist*, 55(11): 1217–1230.
- Hinrichs, C.C. (2000). Embeddedness and local food systems: Notes on two types of direct agricultural market. *Journal of Rural Studies*, 16: 295–303.
- Hirschman, A. O. (1985). Against parsimony: Three easy ways of complicating some categories of economic discourse. *Economics and Philosophy*, 1(1): 7–21.
- Hobson, K. (2006). Environmental psychology and the geographies of ethical and sustainable consumption: Aligning, triangulating, challenging?. *Area*, 38(3): 292–300.

- Hogan, P. (2015). Rethinking global food security and sustainable agriculture: From Europe to the World. Forum for the Future of Agriculture, 31/03/2015, Brussels. <http://ec.europa.eu/agriculture/commissioner-speeches/pdf/hogan-ffa-31-03-2015-en.pdf> (accessed 20 April 2015).
- Hogg, D. (2000). *Technological change in agriculture: Locking in to genetic uniformity*. Basingstoke: Palgrave Macmillan.
- Hole, A. R. (2007). Fitting mixed logit models by using maximum simulated likelihood. *Stata Journal*, 7: 388–401.
- Hole, A. R. (2011). A discrete choice model with endogenous attribute attendance. *Economics Letters*, 110: 203–205.
- Howard, P. H., and Allen, P. (2008). Consumer willingness to pay for domestic ‘fair trade’: Evidence from the United States. *Renewable Agriculture and Food Systems*, 23(3): 235–242.
- Howard, P. H. and Allen, P. (2010). Beyond organic and fair trade? An analysis of ecolabel preferences in the United States. *Rural Sociology*, 75(2): 244–269.
- Hoyos, D. (2010). The state of the art of environmental valuation with discrete choice experiments. *Ecological Economics*, 69(8): 1595–1603.
- Hsieh, M.-F., and Stiegert, K. W. (2012). Store format choice in organic food consumption. *American Journal of Agricultural Economics*, 94(2): 307–313.
- Hughner, R. S., McDonagh, P., Prothero, A., Schultz, C. J., II, and Stanton, J. (2007). Who are organic food consumers? A compilation and review of why people purchase organic food. *Journal of Consumer Behaviour*, 6: 1–17.
- Hunecke, M., Haustein, S., Grischkat, S., and Böhler, S. (2007). Psychological, sociodemographic, and infrastructural factors as determinants of ecological impact caused by mobility behavior. *Journal of Environmental Psychology*, 27: 277–292.
- Hunger in America (1968). CBS News documentary by Carr, M. (Writer/Producer), Davis, P. (Writer), and Hewitt, D. (Executive Producer), U.S.A.: CBS Reports.
- Hu, W., Woods, T., and Bastin, S. (2009). Consumer acceptance and willingness to pay for blueberry products with nonconventional attributes. *Journal of Agricultural and Applied Economics*, 41(1): 47–60.
- Hughner, R. S., McDonagh, P., Prothero, A., Schultz II, C. J., and Stanton, J. (2007). Who are organic food consumers? A compilation and review of why people purchase organic food. *Journal of Consumer Behaviour*, 6: 1–17.
- IFICF (2015). Food and health survey 2015. Washington: International Food Information Council Foundation. <http://www.foodinsight.org/sites/default/files/2015%20IFIC%20Foundation%20Food%20and%20Health%20Survey%20Media%20Guide.pdf> (accessed 20 May 2015).
- Jackson, T. (2005). *Motivating sustainable consumption: A review of evidence on consumer behaviour and behavioural change*. Guildford: Centre for Environmental Strategy, University of Surrey.

- Jahn, G., Schramm, M., and Spiller, A. (2005). The reliability of certification: Quality labels as a consumer policy tool. *Journal of Consumer Policy*, 28: 53–73.
- Jeffreys, J. B. (1954). *Retail trading in Britain. 1850–1950*. National Institute of Economic and Social Research, Economic and Social Studies, XII. Cambridge: Cambridge University Press.
- Jørgensen, U. (2012). Mapping and navigation transitions – The multi-level perspective compared with arenas of development. *Research Policy*, 41(6): 996–1010.
- Kahn, M. E. (2002). Demographic change and the demand for environmental regulation. *Journal of Policy Analysis and Management*, 21(1): 45–62.
- Kahneman, D., and Knetsch, J. L. (1992). Valuing public goods: The purchase of moral satisfaction. *Journal of Environmental Economic Management*, 22: 57–70.
- Kahneman, D., and Ritov, I. (1994). Determinants of stated willingness to pay for public goods: A study in the headline method. *Journal of Risk and Uncertainty*, 9: 5–38.
- Kahneman, D., Ritov, I., Jacowitz, K. E., and Grant, P. (1993). Stated willingness to pay for public goods: A psychological perspective. *Psychological Science*, 4(5): 310–315.
- Kahneman, D., Ritov, I., and Schkade, D. (1999). Economic preferences or attitude expressions? An analysis of dollar responses to public issues. *Journal of Risk and Uncertainty*, 19: 220–242.
- Kahneman, D., and Sugden, R. (2005). Experienced utility as a standard of policy evaluation. *Environmental and Resource Economics*, 32: 161–181.
- Kahneman, D., Wakker, P. P., and Sarin, R. (1997). Back to Bentham? Explorations of experienced utility. *The Quarterly Journal of Economics*, 112(2): 375–406.
- Kaufman, P. (1999). Food retailing consolidation: Implications for supply chain management practices. *Journal of Food Distribution Research*, 30: 5–11.
- Keeling-Bond, J., Thilmany, D. and Bond, C. (2006). Direct marketing of fresh produce: Understanding consumer purchasing decisions. *Choices*, 21(4): 1–6.
- Keeling-Bond J., Thilmany, D. and Bond, C. (2009). What influences consumer choice of fresh produce purchase location? *Journal of Agricultural and Applied Economics*, 41(1): 61–74.
- Kemp, R. (1994). Technology and the transition to environmental sustainability: The problem of technological regime shifts. *Futures*, 26(10): 1023–1046.
- Knoblauch, W. A., Brown, R., and Braster, M. (1990). Organic field crop production: A review of the economic literature. Ithaca: Agriculture Experimental Research, Department of Agricultural Economics, Cornell University. <http://dyson.cornell.edu/research/researchpdf/rb/1990/Cornell-Dyson-rb9010.pdf> (accessed 30 June 2014).
- Knowles, T., Moody, R., and McEachern M. G. (2007). European food scares and their impact on EU food policy. *British Food Journal*, 109 (1): 43–67.
- Knussen, C., Yule, F., MacKenzie, J., and Wells, M. (2004). An analysis of intentions to recycle household waste: The roles of past behaviour, perceived habit, and perceived lack of facilities, *Journal of Environmental Psychology* 24, 237–246.

- Kollmuss, A., and Agyeman, J. (2002). Mind the gap: Why do people act environmentally and what are the barriers to pro-environmental behavior?. *Environmental Education Research*, 8(3): 239–260.
- Kontoleon, A., and Yabe, M. (2003). Assessing the impacts of alternative ‘opt-out’ formats in choice experiment studies: Consumer preferences for genetically modified content and production information in food. *Journal of Agricultural policy and Resources*, 5(1): 1–43.
- Lachman, D. A. (2013). A survey and review of approaches to study transitions. *Energy Policy*, 58: 269–276.
- Lagarde, M. (2012). Investigating attribute non-attendance and its consequences in choice experiments with latent class models. *Health Economics*, 22: 554–567.
- Lairon, D., and Huber, M. (2014). Food quality and possible positive health effects of organic products. In S. Bellon, and S. Penvern (Eds.), *Organic farming: Prototype for sustainable agricultures* (295–312). Dordrecht: Springer Netherlands.
- Lake, D., Sisson, L., and Jaskiewicz, L. (2015). Local food innovation in a world of wicked problems: The pitfalls and the potential. *Journal of Agriculture, Food Systems, and Community Development*. Advanced online publication. <http://dx.doi.org/10.5304/jafscd.2015.053.002> (accessed 25 May 2015).
- Lancaster, K. (1966). A new approach to consumer theory. *Journal of Political Economy*, 74(2): 132–157.
- Leary, M. R., Toner, K., and Gan, M. (2011). Self, identity, and reactions to distal threats: The case of environmental behavior. *Psychological Studies*, 56(1): 159–166.
- Lepper, M. R., Greene, D., and Nisbett, R. E. (1973). Undermining children’s intrinsic interest with extrinsic reward: A test of the “overjustification” hypothesis. *Journal of Personality and Social Psychology*, 28(1): 129–137.
- Lester, G. E., and Saftner R. A. (2011). Organically versus conventionally grown produce: Common production inputs, nutritional quality, and nitrogen delivery between the two systems. *Journal of Agricultural and Food Chemistry*, 59: 10401–10406.
- Lewis, C. (2002). The “poison squad” and the advent of food and drug regulation. *FDA Consumer*, 36(6): 12–15.
- Li, J., Zepeda, L., and Gould, B. W. (2007). The demand for organic food in the U.S.: An empirical assessment. *Journal of Food Distribution Research*, 38: 54–69.
- Lichtenstein, S., and Slovic, P. (1971). Reversals of preference between bids and choices in gambling decisions. *Journal of Experimental Psychology*, 89: 46–55.
- Lima, G. P. P., and Vianello, F. (2011). Review on the main differences between organic and conventional plant-based foods. *International Journal of Food Science and Technology*, 46: 1–13.
- Linares, P., and Labandeira, X. (2010). Energy efficiency: Economics and policy. *Journal of Economic Surveys*, 24(3): 573–592.
- Lindel, D. (2014). *The food and beverage industry in Germany: Industry overview 2014/2015*. Berlin: Germany Trade and Invest.

- Lindenberg, S. (2001). Intrinsic motivation in a new light. *Kyklos*, 54: 317–342.
- Lindenberg, S. (2006). Prosocial behavior, solidarity and goal-framing processes. In D. Fetchenhauer, A. Flache, B. Buunk, and S. Lindenberg (Eds.), *Solidarity and prosocial behavior. An integration of sociological and psychological perspectives* (23–44). Amsterdam: Kluwer.
- Lindenberg, S., and Steg, L. (2007). Normative, gain and hedonic goal frames guiding environmental behavior. *Journal of Social issues*, 63(1): 117–137.
- Loorbach, D. A. (2007). *Transition management: New mode of governance for sustainable development*. Utrecht: International Books.
- Lotz, S., Christandl, F., and Fetchenhauer, D. (2013). What is fair is good: Evidence of consumers' taste for fairness. *Food Quality and Preference*, 30(2): 139–144.
- Loureiro, M. L., and Hine S. (2002). Discovering niche markets: A comparison of consumer willingness to pay for local (Colorado grown), organic, and GMO-free products. *Journal of Agricultural and Applied Economics*, 34(3): 477–487.
- Loureiro, M. L., and Lotade, J. (2005). Do fair trade and eco-labels in coffee wake up the consumer conscience?. *Ecological Economics*, 53(1): 129–138.
- Loureiro, M. L., and Umberger, W. J. (2003). Estimating consumer willingness to pay for country-of-origin labeling. *Journal of Agricultural and Resource Economics*, 28(2): 287–301.
- Loureiro, M. L., and Umberger, W. J. (2007). A choice experiment model for beef: What US consumer responses tell us about relative preferences for food safety, country-of-origin labeling and traceability. *Food Policy*, 32: 496–514.
- Louviere, J. J., Hensher, D. A., and Swait, J. D. (2000). *Stated choice methods: Analysis and applications*. Cambridge: Cambridge University Press.
- Lusk, J. L. (2003). Effects of cheap talk on consumer willingness to pay for golden rice. *American Journal of Agricultural Economics*, 85: 840–856.
- Lusk, J. L., and Briggeman, B. (2009). Food values. *American Journal of Agricultural Economics*, 91(1): 184–196.
- Lusk, J. L., and Norwood, F. B. (2009). Bridging the gap between laboratory experiments and naturally occurring markets: An inferred valuation method. *Journal of Environmental Economics and Management*, 58: 236–250.
- Lusk, J. L., Roosen, J., and Fox, J. (2003). Demand for beef from cattle administered growth hormones or fed genetically modified corn: A comparison of consumers in France, Germany, the United Kingdom, and the United States. *American Journal of Agricultural Economics*, 85 (1): 16–29.
- MacDonald, J. M., and McBride, W. D. (2009). *The transformation of U.S. livestock agriculture: Scale, efficiency, and risks. Economic Information Bulletin No. 43*. Washington: USDA Economic Research Service. [http://www.agmanager.info/about/contributors/Presentations/Langemeier/MacdonaldMcbride\\_2009.pdf](http://www.agmanager.info/about/contributors/Presentations/Langemeier/MacdonaldMcbride_2009.pdf) (accessed 15 December 2013).

- Manstead, A. (2000). The role of moral norm in the attitude-behaviour relation. In D. Terry, and M. Hogg (Eds.), *Attitudes, behaviour, and social context: The role of norms and group membership* (11–30). Mahwah: Lawrence Erlbaum Associates.
- Markard, J., Raven, R., and Truffer, B. (2012). Sustainability transitions: An emerging field of research and its prospects. *Research Policy*, 41(6): 955–967.
- Martinsson, J., Lundqvist, L. J., and Sundström, A. (2011). Energy saving in Swedish households. The (relative) importance of environmental attitudes. *Energy Policy*, 39: 5182–5191.
- Mazar, N., and Zhong, C. (2010) Do green products make us better people?. *Psychological Science*, 21: 494–498.
- McCluskey, J. J. and Loureiro, M. L. (2003). Consumer preferences and willingness to pay for food labeling: A discussion of empirical studies. *Journal of Food Distribution Research*, 34: 95–102.
- McFadden, D. (1974). Conditional logit analysis of qualitative choice behavior. In P. Zarembka (Ed.), *Frontiers in Econometrics* (105–142). New York: Academic Press.
- McMichael, A. J., Powles, J. W., Butler, C. D., and Uauy, R. (2007). Food, livestock production, energy, climate change, and health. *The Lancet*, 370(9594): 1253–1263.
- Meas, T., Hu, W., Batte, M. T., Woods, T. A., and Ernst, S. (2014). Substitutes or complements? Consumer preference for local and organic food attributes. *American Journal of Agricultural Economics*, Advance Access published 12/2014: 1–28.
- Merritt, A. C., Effron, D. A., Fein, S., Savitsky, K. K., Tuller, D. M., and Monin, B. (2012). The strategic pursuit of moral credentials. *Journal of Experimental Social Psychology*, 48: 774–777.
- Merritt, A. C., Effron, D. A., and Monin, B. (2010). Moral self-licensing: When being good frees us to be bad. *Social and Personality Psychology Compass*, 4(5): 344–357.
- Meyer, R., and Sauter, A. (2004). *Regionalität von Nahrungsmitteln in Zeiten der Globalisierung*. Frankfurt: Deutscher Fachverlag.
- Minhoff, C., and Lehmann, S. (2015). BVE-Jahresbericht 2014/2015. Berlin: Bundesvereinigung der Deutschen Ernährungsindustrie (BVE). <http://www.bve-online.de/presse/infothek/publikationen-jahresbericht/bve-statistikbroschuere2015-1> (accessed 25 May 2015).
- Mitchell, A. E., Hong, Y.-J., Koh, E., Barrett, D. M., Bryant, D. E., Denison, R. F., and Kaffka, S. (2007). Ten-year comparison of the influence of organic and conventional crop management practices on the content of flavonoids in tomatoes. *Journal of Agricultural and Food Chemistry*, 55: 6154–6159.
- Moser, R., Raffaelli, R., and Thilmany McFadden, D. (2011). Consumer preferences for fruit and vegetables with credence-based attributes: A review. *International Food and Agribusiness Management Review*, 14(2): 121–142.
- Muller, D., Judd, C. M., and Yzerbyt, V. Y. (2005). When moderation is mediated and mediation is moderated. *Journal of Personality and Social Psychology*, 89(6): 852–863.
- Murray, C. K. (2013). What if consumers decided to all ‘go green’? Environmental rebound effects from consumption decisions. *Energy Policy*, 54: 240–256.



- National Academy of Sciences (1972). *Genetic vulnerability of major crops*. Committee on genetic vulnerability of major crops, Agricultural Board, National Research Council, National Academy of Sciences, Washington.
- Nauc ler, T., and Enkvist, P. A. (2009). *Pathways to a low-carbon economy: Version 2 of the Global Greenhouse Gas Abatement Cost Curve*. In McKinsey & Company (Ed.).
- Nelson, C. H., and Stroink, M. L. (2014). Accessibility and viability: A complex adaptive systems approach to a wicked problem for the local food movement. *Journal of Agriculture, Food Systems, and Community Development*. Online publication. <http://dx.doi.org/10.5304/jafscd.2014.044.016> (accessed 25 May 2015).
- Nestle (2013). Nestle CEO warns water scarcity is major threat to food industry. 25/02/2013, Vevey (CH): Nestle. <http://www.nestle.com/Media/NewsAndFeatures/City-Food-lecture> (accessed 10 July 2013).
- Nestle, M., and Guttmacher, S. (1992). Hunger in the United States: Rationale, methods, and policy implications of state hunger surveys. *Journal of Nutrition Education*, 24(1): 18S–22S.
- Nordlund, A. M., Garvill, J. (2002). Value structures behind proenvironmental behavior. *Environment and Behavior*, 34: 740–756.
- Nurse Rainbolt, G., Onozaka, Y., and McFadden, D. T. (2012). Consumer motivations and buying behavior: The case of the local food system movement. *Journal of Food Products Marketing*, 18(5): 385–396.
-  lander, F., and Th gersen, J. (1995). Understanding of consumer behaviour as a prerequisite for environmental protection. *Journal of Consumer Policy*, 18(4): 345–385.
-  lander, F., and Th gersen, J. (2006). The A-B-C of recycling. *European Advances in Consumer Research*, 7: 297–302.
- Olynk, N. J., Tonsor, G. T., and Wolf, C. A. (2010a). Consumer willingness to pay for livestock credence attribute claim verification. *Journal of Agricultural and Resource Economics*, 35(2): 261–280.
- Olynk, N. J., Tonsor, G. T., and Wolf, C. A. (2010b). Verifying credence attributes in livestock production. *Journal of Agricultural and Applied Economics*, 42(3): 439–452.
- Onozaka, Y., Nurse, G., and Thilmany McFadden, D. (2011). Defining sustainable food market segments: Do motivations and values vary by shopping locale?. *American Journal of Agricultural Economics*, 93(2): 583–589.
- Onozaka, Y., and Thilmany McFadden, D. (2011). Does local labeling complement or compete with other sustainable labels? A conjoint analysis of direct and joint values for fresh produce claim. *American Journal of Agricultural Economics*, 93(3): 693–706.
- OTA (2012). *2012 organic industry survey*. Brattelboro: Organic Trade Association. [http://www.organicnewsroom.com/2012/04/us\\_consumerdriven\\_organic\\_mark.html](http://www.organicnewsroom.com/2012/04/us_consumerdriven_organic_mark.html) (accessed 28 September 2012).

- OTA (2013). *2013 US families' organic attitudes and beliefs survey*. Brattelboro: Organic Trade Association. [http://www.organicnewsroom.com/2013/04/eight\\_in\\_ten\\_us\\_parents\\_report.html](http://www.organicnewsroom.com/2013/04/eight_in_ten_us_parents_report.html) (accessed 18 May 2013).
- OTA (2015). *2015 organic industry survey*. Brattelboro: Organic Trade Association. <https://www.ota.com/news/press-releases/18061> (accessed 20 May 2015).
- Padel, S., and Foster, C. (2005). Exploring the gap between attitudes and behaviour: Understanding why consumers buy or do not buy organic food. *British Food Journal*, 107(8): 606–625.
- Pearson, D., Henryks, J., and Jones, H. (2011). Organic food: What we know (and do not know) about consumers. *Renewable Agriculture and Food Systems*, 26(2): 171–177.
- Pelletier, L. G., Dion, S., Tuson, K. M., and Green-Demers, I. (1999). Why do people fail to adopt environmental protective behaviors? Toward a taxonomy of environmental amotivation. *Journal of Applied Social Psychology*, 29: 2481–2504.
- Perez, C. (1985). Microelectronics, long waves and world structural change: New perspectives for developing countries. *World Development*, 13(3): 441–463.
- Perez, C. (2010). Technological revolutions and techno-economic paradigms. *Cambridge Journal of Economics*, 34(1): 185–202.
- Peters, G., Minx, J. C., Weber, C.L., and Edenhofer, O. (2011). Growth in emission transfers via international trade from 1990 to 2008. *Proceedings of the National Academy of Sciences*, 108(21): 8903–8908.
- Peterson, H. C. (2013). Sustainability: A wicked problem. In E. Kebreab (Ed.), *Sustainable animal agriculture* (1–10). Boston: CAB International.
- Peterson, H. H., and Li, X. (2011). Consumer preferences for product origin and processing scale: The case of organic baby foods. *American Journal of Agricultural Economics*, 93(2): 590–596.
- Pieper, J. R., and Barrett, D. M. (2008). Effects of organic and conventional production systems on quality and nutritional parameters of processing tomatoes. *Journal of Science and Food Agriculture*, 89: 177–194.
- Pieters, R. G., Bijmolt, T., van Raaij, F., and de Kruijk, M. (1998). Consumers' attributions of pro-environmental behavior, motivation, and ability to self and others. *Journal of Public Policy and Marketing*, 17(2): 215–225.
- Pimentel, D. (2005). Environmental and economic costs of the recommended application of pesticides. *Environment, Development, and Sustainability*, 7: 229–252.
- Pimentel, D. (2009). Environmental and economic costs of the application of pesticides primarily in the United States. In R. Peshin, and A. K. Dhawan (Eds.). *Integrated Pest Management: Innovation-Development Process* (89–111). Springer Science+Business Media.
- Pimentel, D., Harvey, C., Resosudarmo, P., Sinclair, K., Kurz, D., ... and Blair, R. (1995). Environmental and economic costs of soil erosion and conservation benefits. *Science*, 267(5201): 1117–1123.

- Pugno, M. (2008). Economics and the self: A formalisation of self-determination theory. *The Journal of Socio-Economics*, 37(4): 1328–1346.
- Raeburn, P. (1995). *The last harvest: The genetic gamble that threatens to destroy American agriculture*. New York: Simon & Schuster.
- Raven, R. (2006). Towards alternative trajectories? Reconfigurations in the Dutch electricity regime. *Research Policy*, 35(4): 581–595.
- Reisch, L. A. (2001). Time and wealth: The role of time and temporalities for sustainable patterns of consumption. *Time Society*, 10(2–3): 367–385.
- Reiser-Fischer, A. (2014). Schwerer Arbeitsunfall bei der Erdbeer-Ernte nahe Gebesee. *Thüringer Allgemeine Zeitung*, 11 June 2014, <http://www.thueringer-allgemeine.de/web/zgt/leben/blaulicht/detail/-/specific/Schwerer-Arbeitsunfall-bei-der-Erdbeer-Ernte-nahe-Gebesee904907224> (accessed 2 July 2014).
- Roberts, T. (2007). WTP estimates of the societal costs of U.S. food-borne illness. *American Journal of Agricultural Economics*, 89(5): 1183–1188.
- Rosa, E. A., and Dietz, T. (1998). Climate change and society: Speculation, construction and scientific investigation. *International Sociology*, 13: 421–455.
- Rousseau, S., and Vranken, L. (2011). The impact of information on the willingness-to-pay for labeled organic food products. HUB Research Paper 04/2011. Brussels: HUB.
- Russell, W., and Zepeda, L. (2008). The adaptive consumer: Shifting attitudes, behavior change and CSA membership renewal. *Renewable Agriculture and Food Systems*, 23: 136–148.
- Ryan, R., and Deci, E. (2000). Self-determination theory and the facilitation of intrinsic motivation, social development, and well-being. *American Psychologist*, 55(1): 68–78.
- Sahota, A. (2014). The global market for organic food and drink. In H. Willer, and J. Lernoud (Eds.), *The world of organic agriculture: Statistics and emerging trends* (125–131). Frick (CH) and Bonn (GER): Research Institute of Organic Agriculture (FiBL) and the International Federation of Organic Agriculture Movements (IFOAM).
- Savage, S. J., and Waldman, D. M. (2008). Learning and fatigue during choice experiments: A comparison of online and mail survey modes. *Journal of Applied Econometrics*, 23(3): 351–371.
- Scarpa, R., Zanolini, R., Bruschi, V., and Naspetti, S. (2013). Inferred and stated attribute non-attendance in food choice experiments. *American Journal of Agricultural Economics*, 95: 165–180.
- Schaack, D., Lernoud, J., Schlatter, B., and Willer, H. (2014). The organic market in Europe 2012. In H. Willer, and J. Lernoud (Eds.), *The world of organic agriculture: Statistics and emerging trends* (207–214). Frick (CH) and Bonn (GER): Research Institute of Organic Agriculture (FiBL) and the International Federation of Organic Agriculture Movements (IFOAM).
- Scharff, R. L. (2010). Health-related costs from foodborne illness in the United States. Washington: Produce safety project at Georgetown University. <http://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.172.4518&rep=rep1&type=pdf> (accessed 20 May 2015).

- Schifferstein, H., and Oude Ophuis, P. (1998). Health-related determinants of organic food consumption in the Netherlands. *Food Quality and Preference*, 9(3): 119–133.
- Schneider, K., and Garrett, L. (2009). Non-therapeutic use of antibiotics in animal agriculture, corresponding resistance rates, and what can be done about it. *Center for Global Development*. <http://www.cgdev.org/article/non-therapeutic-use-antibiotics-animal-agriculture-corresponding-resistance-rates-and-what> (accessed 01 July 2015)
- Scholderer, J., and Grunert, K. G. (2005). Consumers, food and convenience: The long way from resource constraints to actual consumption patterns. *Journal of Economic Psychology*, 26: 105–128.
- Schuitmaker, T. J. (2012). Identifying and unravelling persistent problems. *Technological Forecasting and Social Change*, 79(6): 1021-1031.
- Schuitmaker, T. J. (2013). *Persistent problems in the Dutch health care system: Learning from novel practices for a transition in health care with the UPP framework* (Doctoral thesis, University of Amsterdam). <http://dare.uva.nl/record/1/392648> (accessed 04 December 2014)
- Schultz, P. W. (1999). Changing behavior with normative feedback interventions: A field experiment on curbside recycling. *Basic and Applied Social Psychology*, 21(1): 25–36.
- Schultz, P. W., Nolan, J., Cialdini, R., Goldstein, N., and Griskevicius, V. (2007). The constructive, destructive, and reconstructive power of social norms. *Psychological Science*, 18: 429–434.
- Schwartz, S. H., and Howard, J. A. (1981). A normative decision-making model of altruism. In J. P. Rushton, and R. M. Sorrentino (Eds.), *Altruism and helping behavior* (189–211). Hillsdale: Lawrence Erlbaum.
- Shapiro, C. (1983). Premiums for high quality products as returns to reputations. *The Quarterly Journal of Economics*, 98(4): 659–79.
- Shapiro, S., and Krishnan, H. S. (1999). Consumer memory for intentions: A prospective memory perspective. *Journal of Experimental Psychology: Applied*, 5(2): 169–189.
- Sheeran, P. (2002). Intention–behavior relations: A conceptual and empirical review. *European Review of Social Psychology*, 12(1): 1–36.
- Sheeran, P., and Abraham, C. (2003). Mediator of moderators: Temporal stability of intention and the intention-behavior relation. *Personality and Social Psychology Bulletin*, 29: 205–215.
- Sherman, S. J. (1980). On the self-erasing nature of errors of prediction. *Journal of Personality and Social Psychology*, 39(2): 211–221.
- Sherrill, M. (2008). Self-Serving Bias. *American Psychologist*, 41: 954–969.
- Shove, E., and Walker, G. (2010). Governing transitions in the sustainability of everyday life. *Research Policy*, 39(4): 471–476.
- Slovic, P., Fischhoff, B., and Lichtenstein, S. (1982). Response mode, framing, and information-processing effects in risk assessment. In R. Hogarth (Ed.), *New directions for methodology of social and behavioral science: Question framing and response consistency* (21–35, No. 11). San Francisco: Jossey-Bass.

- Slovic, P., and Lichtenstein, S. (1983). Preference reversals: A broader perspective. *American Economic Review*, 73: 596–605.
- Smith, A. (2007). Translating sustainabilities between green niches and socio-technical regimes. *Technology Analysis & Strategic Management*, 19(4): 427–450.
- Smith, A., and Raven, R. (2012). What is protective space? Reconsidering niches in transitions to sustainability. *Research Policy*, 41(6): 1025–1036.
- Smith, A., Stirling, A., and Berkhout, F. (2005). The governance of sustainable socio-technical transitions. *Research Policy*, 34: 1491–1510.
- Smith, T. G., Chouinard, H. H., and Wandschneider, P. R. (2011). Waiting for the invisible hand: Novel products and the role of information in the modern market for food. *Food Policy*, 36(2011): 239–249.
- Smith-Spangler, C., Brandeau, M. L., Hunter, G. E., Bavinger, J. C., Pearson, M., Eschbach, P. J., ... and Bravata, D. M. (2012). Are organic foods safer or healthier than conventional alternatives? A systematic review. *Annals of Internal Medicine*, 157(5): 348–366.
- Sorrell, S., Dimitropoulos, J., and Sommerville, M. (2009). Empirical estimates of the direct rebound effect: A review. *Energy Policy*, 37: 1356–1371.
- Sparks, P., and Shepherd, R. (1992) Self-identity and the theory of planned behavior: Assessing the role of identification. *Social Psychology Quarterly*, 55(4): 388–399.
- Spash, C. L., Urama, K., Burton, R., Kenyon, W., Shannon, P., and Hill, G. (2009). Motives behind willingness to pay for improving biodiversity in a water ecosystem: Economics, ethics and social psychology. *Ecological Economics*, 68: 955–964.
- Spiekermann, U. (2011). Redefining food: The standardization of products and production in Europe and the United States, 1880–1914. *History and Technology*, 27(1): 11–36.
- Staats, H., Harland, P., and Wilke, H. (2004). Effecting durable change: A team approach to improve environmental behavior in the household. *Environment and Behavior*, 36(3): 341–367.
- Steg, L., and Vlek, C. (2009). Encouraging pro-environmental behaviour: An integrative review and research agenda. *Journal of Environmental Psychology*, 29(3): 309–317.
- Steinfeld, H., Gerber, P., Wassenaar, T., Castel, V., Rosales, M., and Haan, C. D. (2006). *Livestock's long shadow: Environmental issues and options*. Rome: Food and Agriculture Organization of the United Nations (FAO).
- Stern, N. H. (2007). *The economics of climate change: The Stern review*. Cambridge: Cambridge University Press.
- Stern, P. C. (1997). Toward a working definition of consumption for environmental research and policy. In P. C. Stern, T. Dietz, V. R. Ruttan, R. H. Socolow, and J. L. Sweeney (Eds.), *Environmentally significant consumption: Research directions* (12–28). Washington: National Academy Press.
- Stern, P. C. (2000). Toward a coherent theory of environmentally significant behavior. *Journal of Social Issues*, 56(3): 407–424.

- Stern, P. C., and Dietz, T. (1994). The value basis of environmental concern. *Journal of Social Issues*, 50(3): 65–84.
- Stern, P. C., Dietz, T., Abel, T., Guagnano, G. A., and Kalof, L. (1999). A value-belief-norm theory of support for social movements: The case of environmentalism. *Human Ecology Review*, 6(2): 81–97.
- Stern, P. C., Dietz, T., and Kalof, L. (1993). Value orientations, gender, and environmental concern. *Environment and Behavior*, 25: 322–348.
- Stones, R. (2005). *Structuration theory*. Basingstoke: Palgrave Macmillan.
- Summons, T. G. (1968). Animal feed additives, 1940–1966. *Agricultural History*, 42(4): 305–313.
- Tedlow, R. S. (1990). *New and improved: The story of mass marketing in America*. New York: Basic Books.
- Thilmany, D., Bond, C. A., and Keeling-Bond, J. (2008). Going local: Exploring consumer behavior and motivations for direct food purchases. *American Journal of Agricultural Economics*, 90(5): 1303–1309.
- Thøgersen, J. (1999). Spillover processes in the development of a sustainable consumption pattern. *Journal of Economic Psychology*, 20: 53–81.
- Thøgersen, J. (2005). How may consumer policy empower consumers for sustainable lifestyles? *Journal of Consumer Policy*, 28: 143–178.
- Thøgersen, J., and Crompton, T. (2009). Simple and painless? The limitations of spillover in environmental campaigning. *Journal of Consumer Policy*, 32: 141–163.
- Thøgersen, J., and Ölander, F. (2003). Spillover of environment-friendly consumer behaviour. *Journal of Environmental Psychology*, 23: 225–236.
- Thompson, G. D. (1998). Consumer demand for organic foods: What we know and what we need to know. *American Journal of Agricultural Economics*, 80(5): 1113–1118.
- Thompson, G. D., and Kidwell, J. (1998). Explaining the choice of organic produce: Cosmetic defects, prices, and consumer preferences. *American Journal of Agricultural Economics*, 80(2): 277–287.
- Thurstone, L. L. (1927). A law of comparative judgment. *Psychological Review*, 34: 273–286.
- Tiefenbeck, V., Staake, T., Roth, K., and Sachs, O. (2013). For better or for worse? Empirical evidence of moral licensing in a behavioral energy conservation campaign. *Energy Policy*, 57: 160–171.
- Traill, B., and Grunert, K. G. (Eds.). (1997). *Products and process innovation in the food industry*. London: Chapman and Hall.
- Train, K. E. (2003). *Discrete choice methods with simulation*. Cambridge: Cambridge University Press.
- Turner, R. K., Paavola, J., Cooper, P., Farber, S., Jessamy, V., and Georgiou, S. (2002). Valuing nature: Lessons learned and future research directions. *Ecological Economics*, 46(3): 493–510.

- United Nations (1975). *Report on the World Food Conference, Rome, 5-16 November 1974*. New York: United Nations.
- USDA (2014). Table 43 – Selected Practices: 2012; . In *2012 Census of Agriculture* (p. 558). U.S. Department of Agriculture (USDA), National Agricultural Statistics Service.
- van Bueren, E. M., Lammerts van Bueren, E. T., and van der Zijpp, A. J. (2014). Understanding wicked problems and organized irresponsibility: Challenges for governing the sustainable intensification of chicken meat production. *Current Opinion in Environmental Sustainability*, 8: 1–14.
- Vander Naald, B., and Cameron, T. A. (2011). Willingness to pay for other species' well-being. *Ecological Economics*, 70(7): 1325–1335.
- Verbeke, W., and Ward, R.W. (2006). Consumer interest in information cues denoting quality, traceability and origin: An application of ordered probit models to beef labels. *Food Quality and Preference*, 17: 453–467.
- Verbong, G., Geels, F. W., and Raven, R. (2008). Multi-niche analysis of dynamics and policies in Dutch renewable energy innovation journeys (1970–2006): Hype-cycles, closed networks and technology-focused learning. *Technology Analysis and Strategic Management*, 20(5): 555–573.
- Vermeir, I., and Verbeke, W. (2008). Sustainable food consumption among young adults in Belgium: Theory of planned behaviour and the role of confidence and values. *Ecological Economics*, 64(3): 542–553.
- Verplanken, B. (2010). Old habits and new routes to sustainable behaviour. In L. Whitmarsh, S. O'Neill, and I. Lorenzoni (Eds.), *Engaging the public with climate change* (17–30). London: Earthscan.
- Verplanken, B., Aarts, H., van Knippenberg, A., and Moonen, A. (1998). Habit versus planned behaviour: A field experiment. *British Journal of Social Psychology*, 37: 111–128.
- Verplanken, B., Walker, I., Davis, A., and Jurasek, M. (2008) Context change and travel mode choice: Combining the habit discontinuity and self-activation hypotheses. *Journal of Environmental Psychology*, 28: 121–127.
- Verplanken, B., and Wood, W. (2006). Interventions to break and create consumer habits. *Journal of Public Policy and Marketing*, 25: 90–103.
- Voß, J.-P., Smith, A., and Grin, J. (2009). Designing long-term policy: Rethinking transition management. *Policy Science*, 42(4): 275–302.
- Watts, D. C., Ilbery, B., and Maye, D. (2005). Making reconnections in agro-food geography: Alternative systems of food provision. *Progress in Human Geography*, 29(1): 22–40.
- Welsch, H., and Kühling, J. (2009). Determinants of pro-environmental consumption: The role of reference groups and routine behavior. *Ecological Economics*, 69(1): 166–176.
- Witt, U. (2001). Learning to consume – A theory of wants and the growth of demand. *Journal of Evolutionary Economics*, 11(1): 23–36.

- Whitmarsh, L., and O'Neill, S. (2010). Green identity, green living? The role of pro-environmental self-identity in determining consistency across diverse pro-environmental behaviours. *Environmental Psychology*, 30(3): 305–314.
- Wiernik, B. M., Ones, D. S., and Dilchert, S. (2012). Age and environmental sustainability: A meta-analysis. *Managerial Psychology*, 28(7–8): 826–856.
- Wood, W., Tam, L., and Guerrero Witt, M. G. (2005). Changing circumstances, disrupting habits. *Journal of Personality and Social Psychology*, 88(6): 918–933.
- World Bank (2015). World development indicators: CO2 emissions (metric tons per capita) 1960–2013. <http://data.worldbank.org/data-catalog/world-development-indicators> (accessed 4 February 2015).
- Wortmann, M. (2004). Aldi and the German model: Structural change in German grocery retailing and the success of grocery discounters. *Competition and Change*, 8(4): 425–441.
- Yiridoe, E. K., Bonti-Ankomah, S., and Martin, R. C. (2005). Comparison of consumer perceptions and preference toward organic versus conventionally produced foods: A review and update of the literature. *Renewable Agriculture and Food Systems*, 20(4): 193–205.
- Yue, C., and Tong, C. (2009). Organic or local? Investigating consumer preference for fresh produce using a choice experiment with real economic incentives. *HortScience*, 44(2): 366–371.
- Zachmann, K. (2014). Risk in historical perspective: Concepts, contexts, and conjunctions. In C. Klüppelberg, D. Straub, and I. M. Welpé (Eds.), *Risk – A multidisciplinary introduction* (3–35). Cham: Springer International Publishing.
- Zachmann, K., and Ostby, P. (2011). Food, technology, and trust: An introduction. *History and Technology: An International Journal*, 27(1): 1–10.
- Zanoli, R., and Naspetti, S. (2004). Do consumers care about where they buy organic products? A means-end study with evidence from Italian data. In G. Baourakis (Ed.), *Marketing trends for organic food in the 21<sup>st</sup> century* (239–255). London: World Scientific.
- Zelezny, L. C. (2010). Educational interventions that improve environmental behaviors: A meta-analysis. *The Journal of Environmental Education*, 31(1): 5–14.
- Zelezny, L. C., Chua, P.-P., and Aldrich, C. (2000). Elaborating on gender differences in environmentalism. *Journal of Social Issues*, 56(3): 443–457.
- Zepeda, L., and Li, J. (2007). Characteristics of organic food shoppers. *Journal of Agricultural and Applied Economics*, 39(1): 17–28.
- Zhao, X., Lynch, J. G., and Chen, Q. (2010). Reconsidering Baron and Kenny: Myths and truths about mediation analysis. *Journal of Consumer Research*, 37(2): 197–206.
- Zoran, I. S., Kapoulas, N., and Ljubomir, Š. (2014). Tomato fruit quality from organic and conventional production, organic agriculture towards sustainability. In V. Pilipavicius (Ed.), *Organic Agriculture towards Sustainability* (147–169). <http://www.intechopen.com/books/organic-agriculture-towards-sustainability/tomato-fruit-quality-from-organic-and-conventional-production> (accessed 23 June 2014).



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Hiermit erkläre ich,

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