Fertility Intentions: There's More Than We Think (and Sometimes Less)

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Each pair of statements below is true for the contemporary U.S.:

- Fifty percent of pregnancies (and 35% of births) are unintended (Finer and Henshaw, 2006; Martinez, et al., 2006) ;

and

- Intentions are the strongest predictor of a woman's subsequent fertility behavior (Westoff and Ryder 1977; Schoen et al, 1999).

- Birth cohorts of women recently completing childbearing missed their stated intentions (at age 22) by an average of nearly one birth (Morgan and Rackin 2010)

and

- Recent birth cohorts' mean intentions (at age 22) exceed only slightly their completed fertility (at age 40;Quesnel-Vallée and Morgan 2004; Morgan and Rackin 2010);.

While not irreconcilable, the first statement in each pair suggests a more modest role of fertility intentions (on fertility behavior) than the second one. Demographers have debated the value and role of fertility intentions for decades (Klerman, 2000; Morgan 2001; Schoen et al 1999; Luker, 1999). But demographers cannot be divided into those that value them and those that do not. Instead the literature suggests an ongoing struggle to come to terms with the seemingly obvious importance of fertility intentions and the shortcomings of current conceptualizations. Our goal in this paper is to reconcile the above statements by providing a framework for the conceptualization of fertility intentions.

More specifically, we examine the value of fertility intentions for fertility research against the backdrop of theory and research in the cognitive and social sciences. We draw on recent brain and cognition research to contextualize fertility intentions within a broader set of conscious and unconscious mechanisms that contribute to mental function. We also draw on the Theory of Conjunctural Action, which borrows from William Sewell's (1992, 2005) "duality of structure" concept , to theorize the

interactive links between mental processes, the social/material environment, and observed behavior (Johnson-Hanks, et al., 2011). Thus, we theorize intentions in terms of two dualities that shape thought and action: the interplay of automatic and deliberative processes in the brain and the interplay of virtual (ideational) structures and their instantiations in the material world.

Foundations of our Model: Insights from Cognitive Science and Social Theory

We take our definition of intentions from the psychological literature: intentions are complex mental states in which there is a desire for some outcome, a belief that taking a particular action will lead to that outcome, and some degree of commitment to perform the action (Malle et al., 2003). In the model proposed by Fishbein and Ajzen (2010), scientific leaders in intentions research, "intentions" are consciously developed and draw on other mental constructs such as attitudes, desires, and beliefs. Fishbein and Ajzen acknowledge that intentions are socially influenced: intentions are a function of not only the individual's attitudes and beliefs but also the subjectively perceived attitudes and beliefs of others. Intentions mediate the relation between other mental constructs and behavior. Although behaviors may have unintended outcomes, all behaviors are intended in some sense. Intentions are most predictive of behaviors when they are proximate to the context of action and target specific actions (Fishbein and Ajzen 2010).

Three Insights from Cognitive Science

We re-examine this classic psychological model of intentions in the context of three major insights, all drawn from cognitive science. The first is the recognition that the cognition depends on two types of processes in the brain, which we label deliberative and automatic.[1] Deliberative processes include those brain functions we are most familiar with – reasoning, making decisions, simulating future courses of action, and controlling impulses. These are largely conscious and correspond to what we think of as rational thought and free will. Automatic processes in the brain occur outside consciousness. These have a broad range of capabilities: they can sense incoming stimuli, direct attention to what is important, interpret environmental cues, learn new information and store it in memory, retrieve information, produce appropriate action, and even pursue goals (Bargh and Morsella 2008, Gazzaniga 2011). Even complex culturally derived actions, like driving a car, can be largely consigned to automatic

[1] Also referred to commonly as System 1 (automatic)and System 2 (controlled); Lieberman's C (explicit learning and inhibitory, executive control) and X (associative learning, conditioning and automatic or implicit social cognition) systems (Lieberman 2007; Kahneman 2011).

processes once they are learned (Evans 2008). Unconscious brain mechanisms do most of the brain's work and provide the raw material that informs conscious decisions, but deliberative thought can override and redirect automatic processes (Kahneman, 2011). The two brain systems are therefore deeply intertwined and mutually dependent; little of the brain's action, including the formation of intentions, can be understood without reference to both (Lieberman, 2007; Donald, 2002).

One of the major functions of the unconscious brain is to develop mental "maps" of the body and its interactions with the environment. The second major insight we draw on is that this is done on an ongoing basis, largely through automatic processes that represent sensory inputs in the brain, integrate them to produce complete images, and develop schemas representing meanings associated with the images (Damasio 2010). These processes produce patterns of connectivity among neural structures that store[2] knowledge about the self and those aspects of the world that are relevant for survival and well-being. We use the term "schema" loosely to reflect this stored knowledge (DiMaggio 1997, Strauss and Quinn 1997). Schemas can represent concepts held by the brain (for example, the concept of a family) or actions appropriate to particular contexts (for example, using a condom with a new partner). Once established in neural networks, cues from the environment or our own deliberative thought can trigger the activation of schemas, possibly but not necessarily at a conscious level (Strauss and Quinn, 1997; Damasio, 2010). Schemas are linked in neural networks, in patterns of interconnectivity, that reflect their interdependencies in our experience. Thus, for example, for many of us the schema for "playgroup" is more closely connected to "motherhood" than it is to "trash collection."

The third set of insights we draw on is that schemas do not simply represent cold facts or definitions: they are imbued with sensation and feeling and are also more or less tied in to a person's identity or sense of self. Research on "embodied cognition" has shown that schemas are grounded in representations of the sensory, somatic and affective states registered by the brain as we learn and reproduce them (Damasio, 2010; Ignatow, 2007; Smith 1996). The schema for "baby," then, might engage an abstract notion of a recently born organism as well as the sound and image of the word baby, but it will surely engage visual images of a round face and tiny toes, the feel of soft skin, and maybe also that distinctive baby smell. It will also engage feelings we have had in encountering babies: did we melt with pleasure or fear dropping it? These feelings and sensations, experienced over time in our

[2] "Store" is something of a misnomer: what is actually stored is the means to recreate the knowledge or image on an as-needed basis (Clark, 1997)

encounters with babies, help to position the schema in relation to the neural networks in the brain that represent the self. One is more likely to embrace an image of the self as a future mother if one's schema for baby is positive, warm and cuddly than if it holds images of possible failure. Images that are closely linked to the sense of self, in turn, have motivational force (Foote 1951, Hitlin 2003, Strauss and Quinn 1997).

How Structure Affects Cognition

The above account of cognitive function operates in a vacuum. Where do all these schemas come from and how are they connected with affect and motivation? While some basic schemas are innate (Gazzaniga 2011, Miller & Rodgers 2001), most are learned from the environments we live in (Damasio 2010). And because we are first and foremost social animals, the socially structured environment dominates in importance. Social environments, in turn, are structured through another set of dual processes that operate at a level above the individual.

The Theory of Conjunctural Action (TCA; Johnson-Hanks et al. 2011) situates action leading to fertility variation and change in the context of structures that organize social life. Structures can be thought of as recurrent patternings of social life, from things as simple as grocery shopping to those as complex as religion or systems of monetary exchange. Structures are dual: they emerge from the interplay of observable material structures on the one hand (the sight of a woman breastfeeding, Mothers Day cards) and the schematic meanings that they instantiate on the other (babies require nurturing, being a parent conveys status and love). Schematic and material structures are deeply interdependent in their construction and reconstruction of social life, but neither one is totally dependent on the other (Sewell, 1992, 2005).

Structures affect cognition in three important ways. First, because structures pattern observable behaviors and objects in the world, they have a profound influence on the brain's mental maps. Neural networks are structured mainly by recurrent, similarly patterned experience (DiMaggio 1997; McClelland, McNaughton & O'Reilly, 1995, Strauss and Quinn, 1997). We learn that having a baby is cause for celebration from observing others as they celebrate a baby's birth, as well as from public displays of cards and gifts for new babies. Over time, through interaction with the people, things, and events that provide material evidence of the structures that shape our social lives, schemas representing the ideas, scripts, and values associated with these structures take form in our neural networks. This

allows us to reproduce the structure with greater or less fidelity in our own behaviors, thereby reinforcing and/or modifying its material instantiation in the world.

Second, structures affect individuals' day-to-day experiences. These day-to-day experiences influence what schemas people learn, and it also influences the circumstances under which schemas will be activated and brought into conscious thought. In TCA, "conjunctures" refer to situations in which particular structures are brought into play in shaping thought and action. For example, someone graduating from college enters a conjuncture in which structures relating to advanced education, employment, social status, money, intimate relationships, and childbearing all could possibly come into play. What actually enters into the person's thinking depends in part on the material cues present in the conjuncture (did her sister just have a baby? What are her classmates doing?), and in part on how those cues are interpreted through the schemas that her past experience of structures has produced in her brain. She may arrive at a conjuncture with self schemas closely tied to one or another of the structures in play, but what matters for action is whether and how those schemas are activated and re-formed in the context of current circumstances (Miller, 2012).

Third, structures organize the patterns of opportunity and constraint that shape action in conjunctures. When motherhood was a full time job for most women, labor force structures were less relevant to the decisions of a young mother. When work and parenting structures became more compatible, other structures, such as day care and convenience foods, came into play. Structures thus rub up against each other in ways that can pit one set of schemas against another, but they can also be mutually reinforcing, as in the case of day care and working motherhood.

Intentions: A Cognitive-Social Model

What do these ideas from cognitive science and social theory suggest about intentions? We offer the following propositions that build on, but expand and modify the classical psychological model.

First, returning to our definition, intentions entail a desire for an outcome and a belief that a certain action will bring it about. These are schemas. A man forming an intention to become a father would have a schema of fatherhood associated with a high reward value, schemas for certain actions, and schemas that link these actions to becoming a father. An intention also requires some degree of commitment to act. Our model suggests that *an intention is formed when the deliberative brain*

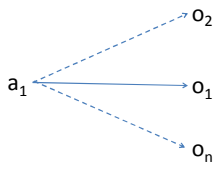
consciously ties this assembly of schemas to the self, thereby giving it the power to motivate action.[3] The precursors of intentions in the classic psychological model, beliefs and attitudes, correspond to schemas with varying degrees of value attached to them. The elaborated model suggested here tells us to look further, however. Beliefs and attitudes emerge from mental representations of parenthood, established over time and experience, which carry not only semantic but affective meanings.[4] These affective meanings lay the foundation for the integration or exclusion of parenthood schemas in neural networks representing the self, and their impact on conscious decision-making.

Second, our model suggests that *action relevant to an outcome need not depend on the individual forming a prior intention.* There are two reasons for this. Cognitive science has shown that while we generally become aware of our actions, action may precede not only conscious deliberation but also awareness (Gazzaniga 2011, Libet et al. 1983). In such cases, action is produced by automatic systems that link meanings to actions, as in when we find ourselves moving towards a crying baby without thinking about it. If the triad of schemas described above link certain actions to fatherhood and if they are positively integrated in the self, then they can produce action when triggered by environmental cues even in the absence of conscious deliberation. Miller (2012) has found significant evidence that fertility desires can bypass intentionality and act directly on behavior to influence fertility outcomes.

The other reason that relevant intentions need not precede action is that actions may be relevant to multiple outcomes, so that intentional action directed at one outcome will have consequences for others. If I form an intention to take action a_1 to obtain outcome o_1, and if a_1 also produces outcome o_2, then o_2 will be an unintended consequence of my action. Further, if o_1 affects the probabilities of yet other outcomes, these too may occur in the absence of any intention.

[3] The self can be thought of as a deeply embodied cognitive process that maps our existence and relation to the outside world and motivates action in the interests of the organism (Damasio 2010). LeDoux (2002) provides a discussion of the neural processes involved in motivation.

[4] Measures of *desires* for parenthood may capture the affect associated with these representations reasonably well, but will not capture the representation itself.



Third, *if an intention is formed, it is likely to influence not only action directed at the specific outcome it targets, but also the organization and affective content of schemas directly and indirectly related to the intention*. The schemas represented in neural networks evolve in response to not only external stimuli but also deliberative thought. The changes are gradual but may be reinforced by strong affective cues and repetition. In this way, conscious goals can become learned and implemented by automatic systems.[5] Because our neural networks link together schemas that co-occur in structures, the changes to the schema associated with a particular action or outcome may have ripple effects that modify related schemas (Smith, 1996).

Fourth, *intentions are framed by structure.* This follows from the fact that the schemas we learn and use most reliably are those that we learn from observing recurring patterns of social life (i.e., schemas represented materially in the world) – the very essence of structure. Because we are exposed to these schemas repeatedly, they become highly accessible to our deliberative systems and provide the baseline assumptions for intention formation. This does not mean that intentions will always mirror the dominant structural patterns, but it does mean that intentions are formed in relation to a structured world.

Fifth, we suggest that *we form intentions only when the circumstances of a conjuncture demand or motivate it.* The formation of intentions requires the action of deliberative processes, and these processes are costly to the brain. They kick in only when necessary, generally when automatic processes are not producing a coherent story or direction for action (DiMaggio 1997, Kahneman 2011). Incoherence generates confusion or a sense of conflict, which in turn trigger deliberation and a conscious decision on how to act. Miller (2012) and Johnson-Hanks (2005) offer a similar view, tying intentions (and action) to the opportunities and constraints inherent in individual's ongoing circumstances.

[5] There are also mechanisms to permit the short-term storage of intentions, but these will fade over time unless integrated in the neural networks that manage long-term memory (McClelland, McNaughton & O'Reilly, 1995).

Using our Model to Reconcile What we Know about Fertility Intentions

How does this re-visiting of the intentions concept in the light of social and cognitive science help to reconcile the seemingly contradictory facts we introduced at the beginning of this presentation? Our facts suggest three questions:

- Why is there so much slippage between intentions and fertility outcomes?
- Why do fertility intentions predict fertility as well as they do?
- What is the predictive value of intentions for fertility at the aggregate level?

We are not the first demographers to tackle these questions. In what follows, we review the evidence and explanations provided by fertility researchers in the past and explore the potential of our model to add depth and new approaches to answering these questions.

Before we address the questions, however, we need to detour in order to clarify a fundamental issue. Demographic research necessarily relies on survey reports of fertility intentions. These have an ambiguous relationship to intentions as defined by psychologists and as discussed above. Our discussion above implies that, at any given point in time, an individual may or may not have formed an intention regarding a particular outcome, and that, in fact, people do form intentions only when motivated in to do so. This argument suggests that fertility intention-making may be a stage in a longer developmental process. We envision a series of stages (Harter 1999). The first stage is experiencing and learning about parenthood from one's own experience of being parented and watching family life unfold in other families and the media. This builds the network of affectively-tagged schemas in the brain about what families look like, how they function, what parents do, what makes a good parent, whether parent-child relationships are loving or conflicted, and so forth. The second stage, overlapping the first, is the organization of this knowledge in relation to mental models of the self and the self-to-be.[6] The third is the conscious development of intentions. We suspect that the first stage begins in childhood,

[6] Warren Miller's work (1992, 2012: Miller & Pasta 2002) provides a similar account, albeit framed in more traditional psychological terms. Miller emphasizes the distinction between desires and intentions, noting that desires are more closely tied than intentions to genetic foundations for fertility motivation (and, we would add, to schemas derived from social experience), and that fertility motivation is a product of both personality traits and developmental experiences.

the second in adolescence, and the third in response to specific conjunctures in the transition to, or during, adulthood.

This has implications for our interpretations of data on fertility intentions or expectations collected in demographic surveys. Given the centrality of the family as a structure and fertility as a component of human biology, it is likely that most people do form fertility intentions at some point before the end of their reproductive lives. However, they do not necessarily do so at the ages that demographers begin asking them our questions (cf. Stevens-Simon, Beach and Klerman, 2001; Ní Bhrolcháin and Beaujouan 2012). Demographers' questions about fertility intentions (and desires or expectations) almost always produce quantitative answers in western cultures. The survey context demands answers, and respondents will generally find a way to provide them. In some cases, the answers may reflect intentions; in other cases, scripts or cultural models imbued with positive affect and integrated into self-schemas (Hayford and Morgan 2008); in yet others, answers may simply reflect basic prototypes of a family – a mother, father and two children, for example – perhaps associated with positive affect but not deeply integrated into a schema of a future self. In the discussion that follows, we refer to the measures used by demographers as "reported intentions", to distinguish them from the more specific psychological construct.

Why is there so much slippage between reported intentions and fertility outcomes?

One of the challenges of studying fertility through an intentions framework is that so many births occur without a prior intention (Finer and Henshaw, 2006). Some of these apparently result from intentional action – not using a condom to demonstrate trust for the partner or rejecting abortion on moral grounds – but these intentions are often grounded in schemas that are far afield from those that would give rise to what demographers think of as fertility intentions. Many demographers focus on such competing values and goals in explaining gaps between fertility intentions and achieved fertility (e.g., Bongaarts & Potter 1983, Morgan and Rackin 2010; Zabin 1999).

The model of the proximate determinants of fertility offered by Davis and Blake (1956) provides a starting point for exploring these competing values and their effects on fertility outcomes. Much theorizing and empirical work treats fertility as the unitary outcome of interest; it is the dependent variable. A primary independent variable is the fertility intention. This produces the simple model (A) below:

(A) Fertility ← Fertility Intention

Of course, other variables, z, can have direct or indirect effects as shown in (B):

(B) Fertility ← Fertility Intention ← z

← z

But fertility results from a process that we represent using the heuristic from Davis and Blake, where variables proximate to fertility are i) sexual intercourse, ii) conception and iii) carrying birth to term. Thus, models (A) and (B) become multidimensional, in the case of (A):

			i)	←	Intention i)	? ← Fertility Intention
(C)	Fertility	←	ii)	←	Intention ii)	? ← Fertility Intention
			iii)	←	Intention iii)	? ← Fertility Intention

Fertility is strongly influenced by actions, intentional or not, relating to having sex, using contraception, and carrying to term. Where intentions relative to these actions exist, they may not accord directly with fertility intentions (or even the schemas that give rise to fertility intentions). Why? We speculate that the schemas that underlie fertility intentions draw on structures related to parenthood and family, whereas those that inform intentions about sex, contraception, and abortion may be more closely associated with structures related to relationships, pregnancy, morality, and risk. Further speculating, part of the reason for this may be that fertility intentions and intentions about sex, contraception and abortion have different temporal frames. Fertility intentions, by definition, can't be carried out "in the moment" whereas the others are associated with varying, but generally shorter, windows for action. These temporal differences may contribute to a tendency for conjunctures to prompt one or the other kind of intention, but not both. In addition, many observers have blamed our high rates of unintended pregnancy on the long-standing reluctance in our culture to discuss sexuality, pregnancy and contraception (Jones et al. 1985). Even while saturating the media with sex, we treat it as something apart from parenthood. If these schemas aren't linked in our experiences, they will not be closely linked in our mental maps, and won't necessarily influence each other unless brought together in a conjuncture.

There is also a second layer of multidimensionality if we acknowledge that a person's life course encompasses a range of domains. For simplicity let's identify four: Fertility (F), Education/Work (W), Leisure (L) and Relationships (R). If we replace fertility in (C) with these four variables, and include in the diagram the intentions relating to each of them, the complexity of the model grows exponentially. As suggested previously, this means that schemas, intentions, and actions related to work, relationships, and leisure can influence fertility outcomes, just as those related to fertility can affect outcomes in other domains. The multiplicity of structures relevant to fertility implies that individuals encounter a great many conjunctures in which action relevant to fertility must be taken. In many of these, the structures and schemas that underpin fertility intentions will not play a major role. Further, conflicts and complementarities among different structures are likely to be accounted for in fertility intentions formed as a result of conjunctures that forced their recognition, but are less likely to be reflected in fertility intentions reported by individuals who have not yet formed intentions.

Beyond the issues raised by competing values and goals, our model suggests other reasons that weaken the link between reported fertility intentions and achieved fertility. The essence of a reported intention may change over time, both qualitatively and quantitatively. Before actual intentions have been formed, reported intentions likely reflect schemas of parenthood. The common observation in low fertility settings that behavior falls short of intentions (Morgan 2003; Quesnel-Vallée and Morgan 2004) may well reflect the move from general dispositions (that are generally favorable toward childbearing /children) to more concrete plans that require tradeoffs and costs. As Iacovou and Tavares (2011) show, the realities of lived experience, both in the formation and dissolution of partnerships and in the raising of children, account for most modifications of individual fertility intentions. Once formed, intentions can change in many ways. They can become less salient; they can change qualitatively (for example, moving from an emphasis on number of children to a desire for a child of a particular sex), or quantitatively -- increasing or decreasing the intended number of children (Hayford 2009). The chances that intentions will change depend on how proximate they are to the opportunity for action. When action is delayed, intentions can be easily diverted or superseded by other intentions drawing on other structures.

Why do fertility intentions predict fertility as well as they do?

Do intentions predict poorly at the individual level? One can frame an answer in one of two ways: absolute and relative. In an absolute frame, the question is "are inconsistencies between intent

and behavior rare?" The evidence is clear -- inconsistency is commonplace (Morgan and Rackin 2010). The relative frame asks: "how do intentions predict relative to some other variable or strategy?" Compared to an uniformed guess, intentions do well. We know of no study that has not rejected the null hypothesis that stated fertility intentions are unrelated to fertility behavior. Instead, the consensus is well-captured by Schoen et.al (1999:790): of all the variables examined "(o)nly marital status has an effect with a magnitude that is comparable with that of fertility intentions". Moreover, intentions bring additional explanatory power and do not simply mediate the effects of more distal variables."

As indicated above, our model predicts that reported intentions can be expected to bear a sloppy relation to actual fertility. However, there are many reasons why these measures work as well as they do at the individual level. At a cognitive level, the schemas that undergird the formation of intentions can influence action even when fertility intentions haven't been formed (Miller 2012). Positive images of family life or of the self as a future parent can spill over to influence the value attached to schemas of action such as having unprotected sex, getting married, or what to do given an unplanned pregnancy - assuming they are linked to parenthood schemas in the brain. Where intentions have been formed, they will affect sex, contraception and abortion in two ways: deliberative action (e.g., see Miller 1986) but also, more gradually, by affecting the organization of neural networks so that the schemas associated with fertility behaviors are more closely tied to identity and more in alignment with the intentions. Thus, if a conjuncture elicits these schemas, they will be more likely to produce behaviors consistent with the intention.

From a structural perspective, the schemas underpinning reported intentions are learned through immersion in a particular social location, characterized by particular material structures. If parenthood is a central route to adulthood in one context and a capstone of adult accomplishment in another, this will affect the nature of parenthood schemas and their organization in relation to other schemas. Even when intentions haven't been formed, these schemas will produce a correspondence in reported intention measures and behavior. The correspondence will be stronger to the extent that people remain embedded in the same structures over time. Navigation of the environment will give rise to conjunctures that elicit these schemas, reinforce them, and produce action that affects fertility outcomes. For example, the only daughter of a professional couple is likely to hold schemas of adult work and family roles that reflect her upbringing and experience. These are likely to prompt a modest report of intended family size regardless of whether she has formed fertility intentions. The same set of

schemas will guide her actions in attending college and beginning a career, making it likely that her completed family size will be similarly modest.

Structures also support the development of realistic intentions. As we suggested, intentions are formed in the context of conjunctures that bring structures into ambiguous or conflicting relations to each other. Why is it, as the evidence suggests, that married women do hit their targets whereas unmarried women more likely fall short of their intentions (Quesnel-Vallée and Morgan 2004; Morgan and Rackin 2010)? One reason is that being married places one in a structural position that brings parenthood to mind and increases the likelihood of conjunctures supportive of or conducive to parenthood. Also, marriage increases the relevance of family-related schemas to the self. By doing so, it may trigger conjunctures that bring conflicts between self-schemas related to work and parenthood into awareness, or conjunctures that reveal an opportunity offered by the coincidence of structures (Johnson-Hanks 2005). Marriage also entails balancing the needs of both partners as well as potentially having children, putting existing self-schemas in doubt. These circumstances produce intentions that have been focused through the lens of intersecting structures that constrain and facilitate the married couple's life.

What is the predictive value of intentions for fertility at the aggregate level?

One of the early uses of reported fertility intentions was to predict the completed fertility for cohorts still in the childbearing years. It was understood that individual women might miss this reported intention "low or high". But it was hoped that these errors would be offsetting, and thus the mean prediction might be on target. Reported intentions are necessarily better predictors of actual fertility behavior at the aggregate level than at the individual level – the bigger the aggregate, the better. The difference in individual error and aggregate error is the difference between gross and net error. Since some individual-level errors are offsetting, the net error must always be less than the gross.

Even aggregate intentions are imperfect at predicting aggregate behavior, however. In the U.S., recent cohorts completing childbearing have come close to meeting their intentions/expectations (that were recorded when these women were in their early 20s; Quesnel-Vallée and Morgan 2004; Morgan and Rackin 2010). But a common finding in other developed countries is that fertility is well below levels suggested by intentions. To return to the language above, intentions predict well at the aggregate level when the net error is close to zero (when there are as many people missing their target high as low).

This assumption can be approximated (as in the U.S.) but frequently it is not (as in most other developed countries). How can the framework developed above help us to understand the relationship between fertility intentions and behaviors at the aggregate level?

Asking the question at the aggregate level focuses attention on social structure – are there regularities at this level and can we identify the mechanisms that produce them? In looking for macro-level explanations that explain aggregate differences, we are not denying micro-level decision making; we view macro-level dynamics as a product of the interaction of micro- and macro-level processes (Johnson-Hanks et al. 2011). However, we assume that the major influences on aggregate measures of fertility also operate, at least in part, at the aggregate level, and therefore are structural in our sense of the word. Thus, emphasis moves away from what happens in the brain to the structures in the world. As we suggested earlier, structures matter in three important ways. First, because they pattern observable behaviors and objects in the world and thus have a profound influence on shared schemas. Second, structures affect individuals' day-to-day experience, and therefore the material circumstances that evoke specific schemas. Third, they organize experience in ways that can facilitate or constrain behavior.

Demographers have long studied such structures. For instance, in the U.S., there is a well-documented stated preference for couples to have a mixed gender composition – to have one son and one daughter (Hank 2007). Further, couples with two children of the same sex are more likely to have a third child (Pollard & Morgan 2002). These regularities reflect the import of the institution of gender and the different roles expected of sons/daughters and girls/boys. In situations where the sex of children cannot be controlled, this preference leads some persons to revise their intentions upward based on their fertility history, and to have more children than in an earlier reported intention. Similarly, some groups may have more unwanted births than others because of the difficulty of obtaining an abortion or because it is less acceptable (Morgan and Parnell 2002).

Alternatively, some women/couples may revise their intentions downward as they age because they develop a career or leisure activities that would be compromised by having more children (Barber 2001). The likelihood of this "competition" (between family and other activities) depends upon a social environment where alternatives are available and acceptable or even encouraged. Postponement can also lead to increased sub- or infecundity (Menken, Trussell and Larsen 1986). The availability and acceptability of treatments for sub/infecundity vary by time and place altering the impact on fertility of

age-related infecundity. In short, our approach is entirely consistent with traditional demographic work that examines mechanisms "in the world" that account for fertility variation over aggregates (defined by place/time).

An existing but under-appreciated framework proposed by Bongaarts (2001; Also see Morgan and Taylor 2006) is quite useful in this regard. As an aggregate model, it is focused on the net difference between intentions and behavior. While the model can be applied (with some minor alterations) to cohorts or periods, we develop it here as an aggregate cohort model.[7] We begin by positing that aggregate behavior will mirror aggregate intentions in the absence of other influences.

TFR= Intentions

Intentions in this model are best thought of as an aggregate reflection of the "best" sized family in a time/place. If this emergent "average" intention is an intention at all, it is one that exists as a schema "in the world", widely shared by those in the population and instantiated in materials – for instance in the size of homes, hotel rooms, cars and taxi cabs.

But we know that some factors will cause fertility to fall short of intentions (S) and some will cause intentions to be surpassed (P). If we posit a simple model then:

TFR = Intentions * (S) * (P), where $S<1$ and $P>1$

One can now speculate about a decomposition of S and P. In Bongaarts's formulation, usual components of S were fertility shortfalls due to sub- or infecundity and to competition with other goals/preferences. P includes unanticipated circumstances such as an infant death, an unsatisfying gender composition of one's children or an unwanted birth. Each leads to more births than stated intentions imply. As noted, cohort experience potentially varies on all these components.

[7] The Bongaarts model is focused on period data (the total fertility rate, TFR) because it is by far the most commonly used and most widely available measure of fertility. The logic of the Bongaarts model follows a woman's or a cohort's experience. Thus, Bongaarts proposes a "synthetic cohort" approach. The left-hand side of the equation is the TFR, often described as a synthetic cohort – the fertility of women if they experienced the age-specific rates that exist in a particular year (or period). The right-hand side variables include a period measure of intentions – what women in a particular year say is their preferred or ideal size family. The macro constraints (S and P) are the ones that exist in a particular period – and would thus operate on the synthetic cohort. One parameter, and an important one, is removed as we move from a period to cohort representation: this is temporal distortion (see Bongaarts and Feeney 1998).

We can posit that each cohort entering the reproductive years does so in the context of interlocking structures. Easterlin's (1978) theory of fertility cycles provides an example. The relative income hypothesis suggests that cohorts born during times of high fertility experience find less favorable labor market conditions than those born during low fertility because of a larger relative cohort size. In their early lives, the children of high-fertility cohorts develop schemas for labor force achievement, consumption, and family formation that become incompatible in the context of the opportunities afforded them in adulthood. This triggers a widespread conjuncture in which employment, family, and consumption structures come into conflict. Theoretically, the conjuncture affords many possible outcomes – reducing consumption is one, reducing fertility is another. The solutions that gain traction do so through a cultural process that resolves the conflict by drawing on schemas supported by existing structures (Quinn, 1996).

Picture the cohort of US men and women born in 1960. In the year they were born, both the percent of men and women ever married and the TFR were at their highest points in the century (US Census Bureau 2007; NCHS 1999). By the time they were 20, families had changed dramatically: the TFR had been cut in half, declining from 3.7 to 1.8; the percent ever married had declined from 77 to 70, and the percent divorced had more than doubled. Still, when asked by NLSY interviewers about their intended fertility in 1982, men and women in this cohort reported an average of about 2.5 births (Quesnel-Vallée and Morgan 2004). This cohort's earliest family experiences occurred in the context of family structures that emphasized marriage and childbearing, but it came to maturity as the children of the baby boom were flooding the labor market. Other things had changed too. The proportion of U.S. women ages 16 and older who were in the labor force had increased from 38% to 52% (Toosi 2002), manufacturing was on the decline and service industries expanding, and educational attainment had increased dramatically. The intentions expressed by this cohort represented a compromise between the family structures they had experienced and the structures that now pressed against them.

The cohort never achieved its reported target: its completed fertility averaged around 2 births – a further compromise as work, family, and other structures continued to evolve, shaping not only what was possible but what appropriate to the times. The final resolution of the conjuncture – limit family size and move to a 2-earner family – drew on existing structures for inspiration, including feminism's insistence on a woman's right to self-fulfillment, credentialing for jobs through education, and ever-expanding consumption standards. It was reinforced by the movement for "zero population growth" (Ehrlich, 1968) which introduced a concept of a new "socially responsible" family size. Simultaneously,

the rapid development of family planning structures facilitated the resolution. The pill and the IUD had been around since the early 1960s, but laws banning contraceptive use were struck down only in 1965, and federal funding for family planning programs did not exist until the 1970s. The legalization of abortion in 1973 further reinforced both the material and schematic underpinnings of "family planning" (CDC, 1999).

Demographers routinely cite statistics that summarize changes in institutional structures when seeking to explain fertility behaviors. Our theoretical priors already include recognition of the interdependencies among different domains of action (e.g., work, family, leisure) and the importance of opportunities and constraints in shaping behavior. What TCA adds to this is the notion that structures do not simply entail costs and opportunities, but also meanings – what is a good size family? What does education mean for a woman? Is marriage a sure thing? Meanings shared at the aggregate level follow a somewhat different dynamic than opportunities and constraints. Both depend on social and institutional processes and both are mutually interdependent (Pollak and Watkins 1993), but the latter is more obviously driven by powerful institutional actors and can change rapidly, whereas the former is more obviously mediated by the minds of interacting individuals and tend to evolve more slowly.[8]

Bongaarts's prediction that aggregate behavior will be a function of both intentions and fertility-constraining or -boosting factors holds up well for the 1960 cohort (see Quesnel-Vallée and Morgan 2004; Morgan and Rackin 2010). But the Bongaarts formulation misses half of the picture by taking intentions as given and focusing attention on fertility behavior. There is also a structural story that lies behind fertility intentions. The cohort's reported intentions appear to have been partly constrained by changing circumstances but also strongly pulled upward by a model of the family that implies at least two children. Cross-sectional data from NSFG shows that women 20-24 expected an average of 2.46 births in 1982, similar to the intentions reported in NLSY for the 1960 cohort (Table 1). During the subsequent two decades, the expectations of later cohorts declined: to 2.34 among women 20-24 in 1988 and 2.32 in 1995, but then bounced up again to 2.44 in 2002. Was this influenced by childhood experience? As the table below shows, neither average aggregate TFR during these cohorts' entire upbringing nor average TFR during middle childhood or late adolescence consistently predict expectations during the early twenties. However, fertility expectations in young adulthood were higher

[8] There are many examples of ideational changes that occur rapidly (e.g., Sewell, 2005, on the French Revolution). These sudden shifts are important to recognize, as is their tendency to emerge from the reorganization or transposition of elements found in existing structures.

for those cohorts that were exposed to higher fertility regimes in early adolescence (ages 10-14). Others (Hayford 2009, Hayford and Morgan 2008, Pearce 2002) also find evidence of childhood influences on fertility expectations at the individual level. Equally plausibly, the structural story may be one of a relatively enduring, culturally shared, schema of the family as including at least two children that is pushed up or down by the evolution of other related schemas. These might include schemas of single parenthood and working mothers, schemas of what parents must invest in children, and schemas about birth timing relative to education and the power of birth control and assisted reproductive technologies. These schemas are integral to structures, but they also have their own life, and may not accurately reflect either current or future conditions.

Table: Average TFRs during childhood years and birth expectations at ages 20-24: Cohorts born approximately 1960-1980

Survey Year	1982	1988	1995	2002
Approximate year of birth	1960	1966	1973	1980
	Average population TFR during years when cohort reached specified ages			
Ages 0-21	2426	2009	1881	1946
Ages 5-9	2626	1953	1809	1900
Ages 10-14	2094	1789	1832	2042
Ages 15-21	1790	1828	2023	2003
	Average number of births expected at ages 20-24			
	2.46	2.34	2.32	2.44

Sources: National Survey of Family Growth and Natality Statistics:
Abma et al 1997; Chandra et al, 2005; Peterson 1995; Martin et al 2011, NCHS 1999

As Bongaarts suggests, the predictive validity of aggregate intentions depends upon multiple aggregate phenomena that drive actual fertility up or down. The Bongaarts framework provides a useful way of summarizing the relevant structures and their influence over time. Less directly, it also provides a way of thinking about what shapes reported intentions themselves. The correspondence between

intentions and fertility will depend on both aspects of structures: the opportunities and constraints that have long been a focus of demographers and the meanings they convey.

Conclusions

What is the "weak link" in intention/fertility research? Do we need more "observations" or a better way of thinking about what we have already observed? We stress the latter. We think our data on intentions are useful, but we need to better understand and use them.

By linking cognitive and social processes, we have developed a framework that more clearly elaborates what fertility intentions reported in surveys may represent for individuals at different stages of their reproductive life. Our framework helps to identify what cognitive and social processes give rise to intentions, and how these processes, as well as intentions themselves, exert an influence on fertility. Our exploration of why fertility fails to match reported intentions at the individual level produces familiar results, but tells a richer, more elaborated story. Our explanation for the power of fertility intentions to predict fertility relies, in part, on individual-level psychology but also structural explanations that have been relatively neglected. And, in moving to understand the predictive power of intentions at the aggregate level, our framework leads us to think not only about how changing structures frustrate or facilitate intentions but also how they contribute to the formation of intentions themselves.

We have shown how our conceptualizations align with basic facts, even those that on their face seem contradictory. Research at the intersection of cognitive science and social demography will require innovative new strategies and measurement. However, much can be done with our traditional surveys. We propose that demographers think about the broader range of cognitive processes that contribute to fertility outcomes and begin to theorize about the circumstances under which fertility intentions may be formed and how these circumstances might affect their chances of being realized. Our framework can yield hypotheses that are testable using the data we have now. By combining independent information on the features of structures with individual life histories, we can also pay greater attention to how structures shape both intentions and their realization. And by expanding the search for independent insights into structural arrangements, we can explore how structures set the scene for unintended fertility. Is it actually true that schemas that underlie fertility intentions draw on structures related to parenthood and family, whereas those that inform intentions about sex, contraception, and abortion

may be more closely associated with structures related to relationships, pregnancy, morality, and risk? And how would we demonstrate that?

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