**Three Essays on Network Dynamics and Liminality**

A Dissertation Prospectus Presented

By

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**Research Summary**

Drawing on network theory and theories of race & ethnicity, this prospectus examines key dynamic social processes driven by liminal individuals seen as people that are in-between symbolic boundaries like those of race or nationality. I propose to conduct three different studies in which culturally liminal agents, and their positions in social structure, are key to understand persisting inter-group inequalities. In the first two chapters, I analyze the role of liminal individuals to overcome the high levels of racial and ethnic segregation observed in adolescent friendship networks. In the third chapter, I analyze migration flows in the Americas between 1960 and 2000. These flows represent the key demographic signature of a liminal population *par excellence*, international migrants. In order to conduct these studies I will mainly rely on networks analysis and agent-based models applied to both novel and existent sources of data.

**Research Questions**

1. Do liminal individuals have higher potentials to span cultural holes, that is, to make segregated networks more compact by bridging people of different cultural backgrounds?
   1. **Are** **culturally liminal individuals associated with wide patterns of adoption of innovations?**
      1. Chapter 1: An analytic chapter describing and analyzing liminality (e.g., multiracial status) and its relationship with the adoption of an innovation using an agent-based threshold model and Add Health data (wave 1). This chapter will also investigate if culturally liminal individuals tend to be structurally liminal as measured by classic indicators like brokerage, betweenness, and egonetwork diversity.
   2. **Are** **culturally liminal individuals associated with wide patters of diffusion of health-related behaviors?**
      1. Chapter 2: An analytic chapter analyzing and comparing different measures of cultural liminality and their relationship with the spread of health-related behaviors, above and beyond network structure, using stochastic actor-oriented models and Add Health data (waves 1 and 2).
2. What is the nature of contemporary migration flows, understood as the main demographic signature of liminality across borders, in the Americas?
   1. **What are the main trends and changes in international migration flows within the Americas between 1960 and 2000?**
      1. Chapter 3: An analytic chapter detailing migration flows between all countries in the Americas using four country-level sociomatrices (i.e. networks) that describe decade-long flows based on my own data set.

**Table 1. Dissertation Structure by Chapter. Research Questions, Methods & Data.**

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| --- | --- | --- | --- |
|  | **Chapter 1** | **Chapter 2** | **Chapter 3** |
| **Title** | Liminality and the diffusion of innovations | Liminality and the social contagion of health-related behaviors | Liminality across borders in the Americas, 1960-2000. Studying Migration Flows. |
| **Research Questions** | Are culturally liminal individuals associated with wide patters of diffusion of innovations? | Are culturally liminal individuals associated with wide patters of diffusion of health-related behaviors? | What are the main trends and changes in migration flows within the Americas between 1960 and 2000? |
| **Method** | Agent-based threshold model | Stochastic actor-based model | Flows-from-stocks methods and circos plots |
| **Data** | 3 Add Health schools (wave 1). | 3 Add Health schools (waves 1 and 2). | Global Migration Flows Data Set (my own data). |

**Prospectus Outline**

This prospectus is structured as follows. First, I define the concept of liminality and connect it to the literature on symbolic boundaries. Second, I focus on race and ethnicity as the most prominent symbolic boundaries to understand segregation in a society like the US. Third, I develop a critical perspective on liminality rooted on the existent literatures on adolescent friendship networks and international migrants. Finally, I provide a detailed account of the aims, research questions, methods, and preliminary findings of the three chapters I plan to write in my dissertation. I end this prospectus with a timeline to develop my dissertation.

**Literature Review**

Symbolic boundaries, like those drawn along race, class, nationality, gender, and ethnicity lines, are of primary interest to sociologists and social scientists (Wimmer 2013; Malkki 1992). Far from being orthogonal, symbolic boundaries very often intersect (Browne and Misra 2003). Furthermore, symbolic boundaries are not ahistorical, fixed or natural, they are rather dynamic and permeable (Mäs, Flache and Kitts 2014; Pachucki, Pendergrass and Lamont 2007). In this context, the idea of liminal populations refers to people that live at the interstices of symbolic boundaries, that is, *betwixt and between* them (Turner 1967). I argue that liminality is important to understand the nature and limits of symbolic boundaries precisely because of the hybrid nature of liminal subjects. In the remainder of this document I will understand liminality as “the state of being associated with people who are simultaneously members of two or more culturally distinct groups, which allow them to move beyond an “either/or” to a “both/neither” path of identification.” (Romo 2011: 404). As can be inferred from Romo’s insight, liminality is intimately associated with culture. Liminal agents are, by definition, culturally liminal.

The concept of liminality has been closely tied with dynamic, rather than static, social phenomena since its very inception. In the classic book *Rites of Passage*, van Gennep (1960) describes life as a series of transitions from one point (e.g. childhood) to another (e.g. adulthood). Conceptually, he divided life transitions in three kinds of rites: rites of separation (preliminal rites), rites of transition (liminal rites), and rites of incorporation (postliminal rites).Van Gennep focused on studying small-scale, traditional (i.e. agrarian and/or indigenous) communities. He analyzed several rites of transition, liminal rites, that are key to understand individuals transitioning between social categories (e.g. single people that get married or women that give birth).

Victor Turner revisited and expanded van Gennep’s concept of liminality. Turner connected liminality and social structure, an intuition key for this prospectus: “If our basic model of society is that of a “structure of positions,” we must regard the period of margin or “liminality” as an interstructural situation.” (Turner 1967: 93). During liminal rites, Turner argues, the liminal persona is usually seen as *ambiguous* because her obligations and rights are not properly defined precisely because she is in-between different positions in social structure. Turner also applied the notion of liminality to analyze transitions between more contemporary roles or “states”[[1]](#footnote-1) like professions (Turner 1967) or to study groups like millenarian religious movements or hippie communities (Turner 1969). It is with the work of Turner, therefore, that liminality starts to be useful to describe contemporary social realities.

More recent research on liminality tends to follow two tracks. First, scholars interested in macro dynamics use liminality to understand transitions of entire societies. Indeed, liminality was introduced to contemporary Sociology by Zygmunt Bauman and S.N. Eisenstadt in order to describe macro changes in present societies. Baumann (1992) used the concept of liminality to analyze the transitions (passages) undergone by post-communist regimes in the late 20th century. Eisenstadt (1995) employed the notion of liminality to theorize about the emergence of movements of protest that are in-between the different groups that control a given society. Still within this macro perspective, Szakolczai (2014) used the idea of liminality to study critical societal changes in Ireland at the turn of the 21st century. Szakolczai emphasized that liminality can, and indeed has been, used to describe states of enduring in-betweenness, that is, extraordinary periods (e.g. crisis) that actually become the norm: “‘permanent liminality’, arguably, offers a particularly helpful tool for sociological understanding: it solves Weber’s puzzle concerning how an out-of-ordinary condition, like charisma, can be ‘routinized’.” (Szakolczai 2014: 34).

The second contemporary literature that has used the idea of liminality is based on a micro oriented approach. The idea of “permanent liminality” mentioned by Szakolczai is also prominent in this micro oriented literature. In this micro oriented approach, however, permanent liminality refers to situations in which subjects have relatively fixed in-between identities as, say, multinational or gay individuals (Clopot 2016; Romo 2011; Anderson et al. 2009; Huang, Yeoh and Lam 2008; Brunsma, Delgado and Rockquemore 2013; Rampton 1999). My dissertation is inscribed in this tradition since I treat both multiracial individuals and migrants as people living in a state of permanent liminality. Given the associations between liminality and hybridity/ambiguity, I argue that liminal subjects are in a good position to act as cultural brokers, that is, to bridge networks that are segregated around symbolic boundaries.

In order to further develop the idea of (ethnoracial) liminality, the following section is centered on the issue of network segregation along race and ethnicity lines. I argue, based on existent research, that the ethnoracial dimension is the single most important factor to explain network segregation in the US.

**Liminality across Which Boundary?**

A prominent analytical and methodological problem in the analysis of symbolic boundaries is how to effectively, and parsimoniously, account for the multiple boundaries that shape the sociodemographic space (i.e. the distribution of traits like race, gender, class in a given society) of a particular social formation. Here, I follow a strategy used by Laumann (1973), and mentioned by Blau (1977: 29), as a possible solution: select one social dimension, “considered on a priori grounds to be of special importance,” in order to focus on, and eventually model, key social dynamics of a given society. I focus on race and ethnicity.

Following Alba’s (2005) terminology, the ethnoracial boundary in the US could be considered as a “bright” boundary. The brightest one, I argue. When compared to blurry boundaries, bright boundaries are difficult to cross since the symbolic distinction they generate “is unambiguous, so that individuals know at all times which side of the boundary they are on.” (Alba 2005: 22). Even though, as Alba argues, the ethnoracial boundary is virtually “uncrossable” for people with certain characteristics (e.g., certain phenotypes), this is not always the case. In general, however, an important part of the reason why this boundary is so difficult to cross is because it is misrecognized as natural (Emirbayer and Desmond 2015). More precisely, Emirbayer and Desmond (2015: 54) argue that race is a “well-founded fiction” since it is unnatural but, at the same time, it is perceived as real (in the sense of natural or biological). In the US, the key implication of misrecognizing race as natural is that social networks are highly segregated along ethnoracial lines.

At this point, a key question emerges: how does empirical segregation, and its pervasive effects, arise from a symbolic boundary, from a well-founded fiction? We know that homophily, or the tendency to interact with those we perceived as similar (e.g., same-race) instead of dissimilar (e.g., different-race), is a bedrock of human interaction (McPherson, Smith-Loving and Cook 2001; Goodreau, Kitts and Morris 2009). As put by McPherson and colleagues (2001: 421), in the US race and ethnicity are key drivers of homophily, and therefore of segregation dynamics: “The extraordinary level of racial/ethnic homophily is due not just to baseline phenomena, however. This sociodemographic characteristic also leads to the highest level of inbreeding homophily (in-group deviations from a random assortment model) of all the characteristics that researchers have studied.”[[2]](#footnote-2) Supporting evidence of the tendency of humans to be part of homophilous relationships has been found both at the genetic level (Christakis and Fowler 2014) and at the level of humanity’s largest gathering, the Kumbh Mela festival in India (Barnett, Khanna and Onnela 2016).

Humans not only select similar people as their associates, however. Influence is a second foundation of human behavior. The fact that individuals tend to influence each other is a major characteristic of human social interactions (Bandura 1977, 1986). Kids are strongly influenced by their parents. Adolescents influence their peers. Adults are influenced by their friends and spouses. It is precisely because of the relational and dynamic nature of influence that the adoption of innovations and behaviors is a classic topic in the study of network dynamics in general, and the adoption of health innovations in particular (Coleman, Katz and Menzel 1957). Similarly, there is also a longstanding tradition in migration studies showing that migrants greatly influence potential migrants by pulling them to their destination (i.e. the host society), thus giving rise to cumulative causation processes (Massey and Zenteno 1999). Here, cumulative causation means that migrant networks can sustain vibrant migration flows over time even if the initial cause of the migration flow (e.g. economic crisis in the country of origin) disappears (Massey and Zenteno 1999; see Cross [1993] on hysteresis in economic systems).

When homophily and influence unfold over time, they can potentially give rise to societies in which the empirical distributions of key sociodemographic traits (e.g. race, income, education) in a population of individuals are highly correlated or, in Blau’s (1977) terms, *consolidated*. For instance, in a highly consolidated society (e.g., a caste-like society), knowing an individual’s position in a sociodemographic dimension (e.g., occupational prestige) can provide a very precise estimate of the position they occupy in several other sociodemographic dimensions (e.g. class, gender, religion). Given that networks are natural social conduits of influence and homophily, they can reinforce segregation along symbolic boundaries that are key to distinguish between in-group (‘Us’) and out-group (‘Others’) members in a given society (Macy, Kitts, Flache and Benard 2003; Centola 2015).

A corollary of the above argument is that, when an innovation emerges, it is also likely to be confined within the symbolic boundaries that segregate actors in a given social network (DiMaggio and Garip 2011). In a word, networks can be expected to (re)produce high levels of inter-group inequality because they tend to map onto (i.e. be correlated to) symbolic boundaries, especially if they are bright boundaries. We know, for example, that inter-group health disparities can be expected to emerge in social networks due to the important role of homophily in the adoption of health innovations and health behaviors (Centola 2011; see also Chang and Lauderdale 2009; Christakis and Fowler 2013).

I submit that leveraging the role of culturally in-between and culturally ambiguous (i.e. liminal) individuals might prove crucial to overcome some of the formidable barriers created along the lines of symbolic boundaries. More specifically, I argue that identifying individuals at the cultural interstices of two or more symbolically segregated groups could increase the leverage of networks to address inter-group inequalities. I then ask the following overarching research question: do liminal individuals have higher potentials to make segregated networks more compact, that is, to span “cultural holes” (Pachucki and Breiger 2010), by bridging people of different cultural backgrounds? I argue that, due to their multifaceted identities, liminal individuals are likely to play this critical brokering role. Given the brightness of race and ethnicity boundaries in the US, my dissertation will pay particular attention to boundary-spanners along ethnoracial lines, or *racial brokers*, that is, individuals that tend to connect people of different races and ethnicities, people that are otherwise disconnected. Put simply, I argue that there are good theoretical reasons to expect that racial brokers in the US are exceptionally well-positioned to bridge cultural holes.

My dissertation will focus on two sets of liminal agents. First, I argue that international migrants (and migrants more generally) can be fruitfully considered as bridges between two worlds, the host and origin societies (Roll and Leal 2010). In this regard, it is worth noting that migration as a social process can, and often is, shaped by symbolic boundaries (e.g. migration is a gendered process; see Malhotra, Misra, Leal 2016; Misra, Malhotra, Leal under review). Second, I will also focus on the role of multiracial individuals as potential racial brokers in the context of adolescent friendship networks. In the next section, I develop a critical theory of liminality based on these two sets of liminal populations.

**Towards a Critical View of Liminality**

Being able to present yourself to others, and be perceived by others, with no ambiguity (i.e. being categorically bona fide: ‘I am Black’, ‘she is Black’) offers a wealth of advantages. In this section I develop a set of arguments, rooted in the experiences of liminal adolescents and international migrants, in order to advance a nuanced and critical perspective on liminality. I present these arguments in the form of three critical qualifications.

*Do not romanticize liminality*. Gloria Anzaldúa’s *Borderlands/La Frontera* (1987) is perhaps one of the best known contemporary pieces on liminality. In her book, Anzaldúa describes the life of migrants in a liminal geographic space, Aztlán (the ‘borderland’ between Mexico and the US Southwest). When international migrants cross over a national border, Anzaldúa argues, they are also crossed over (*atravesados*) by that very same border. This condition of permanent liminality is experienced by migrant populations like international migrants, internal migrants, and gypsies (Mann 2016). Anzaldúa powerfully argues:

“A borderland is a vague an undetermined place created by the emotional residue of an unnatural boundary. It is a constant state of transition. The prohibited and forbidden are its inhabitants. *Los atravesados* [the crossed over]live here: the squint-eyed, the perverse, the queer, the troublesome, the mongrel, the mulato, the half-breed, the half dead; in short, those who cross over, pass over, or go through the confines of the “normal.”” (Anzaldúa 1987: 3, italics in the original)

Liminality is viscid. Liminality does not usually die with those who initially transgress the boundaries of nationhood, the first generation. Liminality gets transferred to their offspring, and the offspring of their offspring. Anzaldúa, for example, provides accounts of fifth generation Mexican Americans living in the borderland that are still deported to Mexico due to their phenotype.[[3]](#footnote-3)

The concept of the transnational family (Parrenas 2005) also illuminates the complexity of liminal identities. A transnational family is comprised of members located in two or more nation states. Transnational families encounter several difficulties like those associated with the recurrent sense of loss experienced by the daughters and sons that are left behind by their parents, especially by their mothers, in the country of origin. “Transnationals, and their family members often grapple with a sense of liminality –a state of ambiguity, openness and indeterminacy of identity– as they negotiate their transnational life courses.” (Hung et al 2008:7). The notion of transnational families has been used to make a call to expand the notion of family itself since the literature often assumes that family members enjoy the advantages of physical proximity (Mazzucato and Schans 2011).

Perhaps one of the most complex links between liminality and disadvantage is embodied in the experience of refugees and displaced peoples. To be sure, refugees have been repeatedly conceptualized as liminal agents (Malkki 1992; Williams 2006; Chavez 1992). Their resettlement in the host society is usually traumatic, which might partially explain why refugees tend to be affected by mental health disorders (Fazel, Wheeler and Danesh 2005). In the middle of World War II, for instance, Weil (1987: 41, cited in Malkki (1992: 24) said: “to be rooted is perhaps the most important and least recognized need of the human soul.” The case of refugees is without a doubt a reminder that a state of permanent liminality is not necessarily free of burdens (Williams 2006).

In the literature on adolescent friendship segregation, there is also evidence that guards against a purely romanticized view of liminality. A recent study by Boda and Néray (2015) collected data from a sample of non-Roma Hungarian and Roma Hungarian secondary school students. They found that both minority and majority students tend to dislike students with inconsistent ethnic identifications (self-declared vs. peer-based ethnicity do not coincide). This finding is important because it reminds us that exhibiting *ambiguous* (ethnoracial) identities, which is a key signature of liminal identities, could represent a social burden for individuals (see also Aires [2008] on the struggles of working-class students at elite colleges).

In conclusion, ambiguity and hybridity are far from being purely positive traits. Importantly, those who are in-between bright boundaries are certainly at risk of experiencing the dark side of liminality. Moreover, liminality, and its complexities, do not end with the liminal persona, they usually extend to their family and even to future generations.

*Do not naturalize liminality*. Bridging culturally different Others should not be misrecognized as a natural talent of liminal agents. Here, a powerful empirical case is that of the so-called 1.5 generation migrants (Ang 2001). This subset of migrants are adolescents that migrated with their parents during their early teens. 1.5 generation migrants are hybrid by definition since they live in culturally dualistic realities, shaped by the culture (e.g. the language) of the origin and host societies. These migrants have been explicitly conceptualized as in-between or liminal individuals in the past (Wang and Collins 2016; Bartley and Spoonley 2008). Critically, Wang and Collins (2016) provide qualitative evidence of how 1.5 generation Chinese migrants in New Zealand bridge cultural differences with European New Zealanders (Pākehā) through cosmopolitan cultural norms.[[4]](#footnote-4) The authors emphasize, however, that 1.5 generation individuals do not have an inherent ability to negotiate cultural differences. Rather, this ability emerged from recurrently being exposed to difficult situations/interactions precisely because of their cultural in-betweenness. These difficult situations, in turn, arose from the fact that 1.5 generation migrants have to negotiate difference in their everyday life in the context of systematic power dynamics vis-à-vis the dominant group.

In a similar vein, Emirbayer and Desmond (2015) discuss the idea of *multiracial competence*. Here, they have in mind “skilled code switchers” who can traverse racial boundaries with certain ease. They, for instance, mention “the Mexican American executive who excels in the majority-white corporation but who speaks Spanish at home.” (Emirbayer and Desmond 2015: 175). The authors readily emphasize the idea that this cultural “code switching” (e.g. voice inflections, ‘passing’), and the multiracial competence it entails, is socially learned.

Further, albeit relatively indirect, evidence in this regard comes from the literature on socialization patterns of adolescents. Edmons and Killen (2009) found that parental racial attitudes affected interracial friendship formation. They based their findings on a sample of racially diverse high school students located in the U.S. Mid-Atlantic region. The authors found that negative parental racial attitudes were associated with lack of intimacy in adolescents’ (platonic and non-platonic) interracial relationships. Similarly, in a study of German and Dutch students, Smith, Maas, and van Tubergen (2014) found that parental influence on adolescents’ cross-ethnic relationships was especially evident in terms of parents acting as role models for cross-ethnic relationships. More precisely, Smith et al. (2014) found that adolescents tended to have more inter-ethnic relationships when their parents were less willing to maintain in-group traditions or more willing to have out-group friends themselves.

In sum, the case of 1.5 generation migrants and the literature on socialization and cross-ethnic relationships, prevent us from assuming that liminal individuals (e.g. multiracial individuals) are naturally inclined to bridge cultural holes. Bridging cultural holes is a social skill rather than an innate talent. Bridging cultural holes is also a difficult task since it involves negotiation of difference in situations where liminal agents have to interact with higher status peers that might likely see them as inferior due to their hybridity.

*Do not universalize ethnoracial liminality*. Race and ethnic boundaries are symbolically and socially constructed and because of that are context dependent (Omi and Winant 1986; Lamont 2000). The fact that race is a bright boundary in the US does not mean a) that this is also the case in other latitudes; and/or b) that the way race (e.g. blackness) is experienced in the US is universal. A corollary of this argument is that racial liminality could be especially important to bridge cultural holes in the US but not in other places. Alba (2005) for instance, argues that in the case of France and Germany the discourse of difference typically discards the notion of race.

Another compelling argument in this regard comes from Davis (1991) and Telles and Sue (2009). According to these authors, liminal individuals can have different status depending on country and time. They argue that in Korea, Korean Americans have lower status compared to their non-liminal counterparts; that mulattoes in pre-1960 Haiti had higher status than their non-liminal counterparts; and that mulattoes’ status in Colombia and Brazil is highly variable, depending more on class than on skin color. Further evidence confirmed that *color elasticity* (Telles and Paschel 2014), the degree to which skin color predicts racial identification, was indeed found to be intermediate in Colombia and Brazil, that is, there is a mild association between skin and race in these countries.

The notions of liminality in general, and multiracialism in particular, are not universal across countries, nor are universal across the history of the US. Different rules to classify multiracial people –especially multiracial individuals with African descent– have been used in the US for centuries (DaCosta 2007). The dynamism of racial classifications is key to remember that race and ethnicity are not material or fixed, and because of that, should not be reified. For instance, at certain critical junctures, some individuals accrue honorary tickets to enter the dominant group, which in the long run reinforces racial boundaries by keeping symbolic distinctions (e.g. Us versus Others) very much alive. We know that the white boundary in the US, that is, white as a racial category, expanded over the course of the 20th century to include second and third generation Irish and Italians (Alba and Nee 2009; Portes and Rumbaunt 1996). More recently, the Latin Americanization thesis (Bonilla-Silva 2002; 2004) argues that the racial hierarchy in the US is now tripartite (whites, honorary whites, and collective blacks), rather than bipartite (whites & non-whites). Experimental evidence on influence processes in task-oriented groups supports this hypothesis (Biagas and Bianchi 2015).

In sum, I argue that (ethnoracial) liminality is highly malleable in two main ways. First, the definitive centrality of race and ethnicity in the US is not always corroborated in other countries; thus, racial liminality might be more prominent in certain societies than others. Second, ethnoracial classifications are fluid: racial hybrids in one country, might not be hybrids in others. Similarly, the degree of liminality associated with the offspring of certain migration groups vary, and this variation depends on time and racial group (e.g. Italian Americans today versus Italian Americans in the early 20th century). In a word, the primacy, meaning, and consequences of (ethnoracial) liminality are not universal.

Throughout this section I have argued that (ethnoracial) liminality should not be romanticized, naturalized, or universalized. Now, I enough theoretical traction to revisit one of the main tenets of this prospectus: culturally liminal individuals have higher potentials to span cultural holes, that is, to make segregated networks more compact by bridging people of different cultural backgrounds. Since I developed a set of critical theoretical arguments around the concept of liminality, I would also like to develop a set of boundary conditions for my hypothesis.

Finding evidence of the potential of liminal agents to span cultural holes in the US does not mean that: a) positive findings should be expected in other countries. For instance, I would expect class brokers to be equally or more influential to bridge cultural holes in countries like Colombia or Brazil; b) liminal agents have a natural ability to act as cultural translators. Studying the specific ways in which liminal agents learn how to do cultural translations between segregated groups is, therefore, an important area of research; c) liminal agents are not a homogenous and/or fixed population. Certain liminal agents enjoy higher status than others. Similarly, certain liminal subjects might have been considered highly liminal in the past, but not necessarily today; and d) liminality, and multiracialism more specifically, should not be considered as *the* solution to the entrenched inequalities on which the US racial formation rests. Part of the reason why this is true is because the idea of multiracialism is not a negation of race, it is, on the contrary, rooted on the idea of race (Telles and Sue 2009; Emirbayer and Desmond 2015; Dacosta 2007). In fact, racial mixture has long existed in the US, but a highly unequal racial order continues to be in place.

None of the above contradicts the fundamental fact that in the US race and ethnicity are the most powerful correlates of the empirically observed levels of segregation in social networks (Giordano 2003; Moody 2001; McPherson et al. 2001). Since this fundamental fact remains true, skilled individuals that can have good chances of bridging racially segregated networks are very much in need. It is certainly my hope that finding positive evidence that liminal agents tend to perform the difficult task of bridging segregated networks could translate into a better understanding of liminal agents and, ultimately, in useful scientific knowledge that support their brokering endeavors. I now turn to describe the three papers I plan to develop in order to generate deeper insights into the lives and practices of liminal agents.

**Liminality and the Diffusion in Networks: The Case of US Adolescent Friendships**

Both chapters 1 and 2 of my dissertation will study liminality in adolescent friendship networks. The sociological study of adolescent friendship, and adolescent friendship segregation, has been highly intertwined with network-analytic approaches since its onset (Coleman 1961). I understand friendship segregation as: “the correspondence between an attribute that define a class of people [e.g. race and ethnicity] and friendship choice.” (Moody 2001: 681).

The most prolific and influential scholar in the early sociological literature on adolescent friendship segregation is Maureen Hallinan. Using a longitudinal design based on a sample of students from northern California, Hallinan and colleagues found that cross-race friendships tend to be unstable over time (Hallinan 1978, 1982), that whites tend to do less cross-race friendship nominations than blacks (Hallinan and Teixeira 1987) and that contextual factors (e.g. a greater ratio of black to white students) are associated with greater stability of interracial friendship nomination (Hallinan and Williams 1987). Friendship segregation along racial lines was also found in a nationally representative longitudinal sample of black and white US high school students (Hallinan and Williams 1989).

A wealth of evidence supports Hallinan’s findings. In fact, recent studies have replicated these results using more racially diverse samples and more sophisticated methods. In general, following Rivera and colleagues’ terminology (Rivera et al. 2010), this literature has found that the emergence, stability, and dissolution of adolescent friendships are affected by: a) *assortative mechanisms* like ethnic and racial homophily (e.g., Windzio and Bicer 2013; Ball and Newman 2013; Zeng and Xie 2008; Kao and Joyner 2006; Baerveldt et al. 2007; Leszczensky and Pink 2015); b) *relational mechanisms* like reciprocity (Williams 1989; Frank et al. 2013; Rude and Herda 2010) or clustering and closure (Goodreau et al. 2006; Moue and Entwisle 2006); and c) *proximity mechanisms* like propinquity (Quillan and Campbell 2003; Mouw and Entwisle 2006; Vermeij et al. 2009), shared foci/contexts (McFarland et al. 2014; Frank, Muller and Muller 2013; Moody 2001), or population structure (Goodreau et al. 2006; Mcfarland et al. 2014; Smith et al. 2016).

Two studies related to liminality and friendship segregation are especially important for this prospectus. First, Stark and Flache (2012) study friendship segregation among secondary school Dutch students. They find compelling evidence that ethnic segregation in adolescent networks can emerge when opinions about a common interest like taste in music is correlated with ethnicity. In the case they analyze, this correlation helps explain why a program intended to reduce violence between adolescents ended up having the complete opposite effect due to antagonistic subcultures galvanized around music and ethnicity. This study reminds us that ethnicity, and the symbolic space it encompasses, is usually correlated with many other cultural domains. Importantly, liminal individuals could be important to reduce polarization when highly racialized third cultural domains (e.g. music taste) exist in a given population.

Second, both longitudinal and experimental evidence from the Netherlands suggests that young immigrants with a strong national identification with the host society are usually chosen as friends by native peers over immigrants with a weak national identification with the host society (Verkuyten and Thijs 2010; Verkuyteen, Thijs and Sierksma 2013; Leszczensky et al. 2016). I argue that this evidence suggest culturally in-between individuals (e.g. immigrants with strong identification with the host society) are indeed more likely to make segregated networks more compact by bridging cultural holes.

Albeit restricted to the US and Western Europe, the findings on racial and ethnic segregation in adolescent networks consistently show that racial and ethnic segregation are very prominent in friendship networks. Based on this literature, I expect to find evidence of racial and ethnic homophily in my analyses. I also expect racial and ethnic boundaries to be a critical factor associated with important barriers for diffusion. Finally, and more importantly, I expect that multiracial individuals and/or those associated with ambiguous racial identities (e.g. those belonging to the “other” race category) are associated with both wider patterns of adoption of innovations and with positions in social structure that indeed allow them to bridge culturally different groups.

I plan to use both agent-based computational models and inferential network methods in order to analyze the role of liminal agents in this regard. The data for both chapter 1 and chapter 2 will come from the first and second wave of the National Longitudinal Study of Adolescent Health (Add Health). This data set uses a measure of friendship relationships that combine *interpersonal sentiments* and *role relations* (Kitts 2014) since students were asked to nominate their best five female and best five male friends.[[5]](#footnote-5) This means that it is possible that student A nominates student B as a friend (A 🡪 B), while the reciprocal behavior (B 🡪A) is not necessarily true. I will, however, base my analysis on a fully reciprocal (i.e. undirected) version of these network data. I do this for theoretical and empirical reasons.

Theoretically, Hartup and Stevens (1997, 1999) argue that there is a deep structure and a surface structure to friendship. They refer to the deep structure of friendship as the *essence* of the relationship, while considering the surface structure dependent on the particular social exchanges that are typical of a specific developmental stage. According to Hartup and Stevens, the essence (i.e. deep structure) of friendship in Western cultures is *symmetrical reciprocity*, which is exchange marked by mutuality and reciprocation (see also Bukowski and Hoza 1989). Surface structures, on the other hand, depend on the developmental stage of the individuals involved. For example, while children exchange time together playing with their friends, friends in adolescence tend to engage in exchanges that support a sense of self-identity (Hartup 1997).

Empirically, a wealth of evidence based on friendship nomination data, includingAdd Health data, has shown the clear existence of a positive reciprocity effect in this kind of data, that is, adolescents do exhibit a general tendency to reciprocate an incoming friendship nomination after controlling for possible confounding factors like homophily, propinquity, triad closure or in and outdegree (e.g. Leszczensky and Pink 2015; Snijders and Baerveldt 2003; Gesell, Tesdahl and Ruchman 2012; Moody 2001). In other words, Hartup and Stevens’ theoretical notion of friendship having a deep structure based on reciprocity has received extensive empirical support on the basic –albeit fundamental– fact that friendship is a relationship in which mutual acknowledgement is key (Kitts 2014). Furthermore, computational experiments and observational evidence have shown that reciprocity may be the key component to distinguish human social networks from technological networks like the internet (Schnegg 2006). In this prospectus, therefore, I will understand that a friendship has to be a mutually agreed-on (i.e. a reciprocated) social relationship that occurs in the context of a given dyad (Wentzel, McNamara and Caldwell 2004).[[6]](#footnote-6)

I am not the first one to assume reciprocity as a necessary condition to analyze friendship nomination data (Parker and Asher 1993; Wentzel et al. 2004, Reiter-Purtill et al. 2010; Berndt and Perry 1986; Bagwell et al. 1998; Goodreau et al. 2009; Hruschka 2009). However, most scholars analyze friendship nomination data *without* using reciprocal nominations as a way to identify friendship relationships (Moody 2001; Hallinan and Williams 1987, 1989; Quillian and Campbell 2003; González et al. 2007; Kao and Joyner 2004, 2006; Smith et al. 2016; Clark and Ayers 1992).

Ball and Newman (2013) use the Add Health data set to suggest a possible interpretation about the nature of unreciprocated friendship nominations. They argue that unreciprocated friendship nominations could represent either missing data, since most surveys put a cap on the number of friendship nominations a given student can make[[7]](#footnote-7), or *aspirational friendships*, that is, “hopes of friendship with higher-ranked individuals that are, at present at least, not returned.” (Ball and Newman 2013: 26). In this regard, they find preliminary evidence in favor of the latter interpretation. Similar results with regards to the observed asymmetry (i.e. lack of reciprocity) of Add Health friendship nomination data is reported by Zeng and Xie (2008). Unreciprocated friendship nominations could also represent missing data because some of these nominations might simply correspond to new or unstable friendships which are in the process of either disappearing or becoming reciprocated (cf. Frank, Muller, and Muller 2013).

Since there is no possible way to know what unreciprocated friendship nominations in Add Health exactly represent, I decided to make the least strong, and least data-restrictive, decision of working with a *weakly* (instead of strongly) symmetrized[[8]](#footnote-8) version of Add Health’s original friendship nomination data. This means that I assume that all the observed friendship nominations in Add Health are indicative of a friendship-like (i.e. reciprocal) relationship. The descriptive statistics of the largest component of Sunshine High, which represents the final sample of nodes and ties under analysis, are shown in Table 2. Even though I plan to use two other schools in my dissertation, I will substantiate this prospectus with data from Sunshine High only.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Table 2. Descriptive Statistics and Racial & Ethnic Composition of Sunshine High** | | | | | |
| **Network Descriptive Statistics** | | **Race & Ethnicity %** | | | **Sociogram** |
| Number of nodes | 1,452 | White | | 18.18 |  |
| Number of dyads | 2,979 | Black | | 19.15 |
| % isolates\* | 11.73 | Native American | | 1.79 |
| Graph density | 0.003 | Asian | | 33.61 |
| Mean geodesic distance | 1.37 | Other | | 21.42 |
| Mean degree | 4.14 | Multiracial | | 5.85 |
| Modal degree | 2 | Latino (any race) | | 39.94 |
| Avg. local clustering coeff. | 0.18 |  |  |  |
| Mean path length | 6.50 |  |  |  |
| Degree centralization | 0.01 |  |  |  |
| Ln[Gross friendship. segre.]\*\* | 1.63 |  |  |  |
| Size largest clique | 6 |  |  |  |
| \*Before retaining the largest component. All statistics were calculated with the SNA package (Butts 2016)  \*\*Gross friendship segregation (α) “is substantively interpretable as the odds ratio of a friendship between members of a same-race dyad relative to friendship in a cross-race dyad. When alpha = 1, then the odds of a same-race friendship equal the odds of a crossrace friendship, and the setting is perfectly integrated. As alpha increases, the relative odds of a same-race friendship increase by a factor of alpha. Since a s scaled from 0 to infinity, I use ln(α), which ranges from - infinity to infinity." Moody (2001: 692) | | | | | |

In the following sections I provide detailed information in terms of the content of chapters 1 and 2 of my dissertation, which as mentioned above, will both be based on this data set. Chapter 1 is a study on the diffusion of innovations. Chapter 2 is a study on the diffusion of health-related behaviors. Both studies will be primarily focus on the role of liminal agents in these processes.

**Chapter 1. Liminality and the Diffusion of Innovations**

Culture and networks mutually produce each other (Pachucki and Breiger 2010; Lizardo 2014). In this context, I argue that due to their in-between identities, liminal individuals are likely to be well-suited to span cultural holes, that is, to make networks more compact by bridging people of different backgrounds. The specific research question that guides chapter 1 reads as follows: **are** **culturally liminal individuals associated with wide patterns of adoption of innovations?** In order to answer this question, I plan to conduct three different analyses. First, I want to provide evidence that race and ethnicity are indeed bright boundaries that impede the diffusion of innovations. Second, I want to provide evidence that (ethnoracial) liminal agents have the potential to bridge different races and ethnicities. Third, I want to provide evidence that liminal agents are associated with wide patters of adoption of innovations

I plan to explore these questions using agent-based models and network analysis. I created an agent-based model that reproduces the social structure of Sunshine High. This means that I generated 1,452 agents, where each agent represents a student in Sunshine High (see descriptive statistics in Table 2). I then bestowed each agent (i.e. each student) with the characteristics he/she reported in the survey: age, socioeconomic status, grade, sex, race, and ethnicity. A similar procedure was implement by DiMaggio and Garip (2011) using GSS survey data. I generated a link between each agent, ego, and all the other agents, alters, he/she reported as his/her friends in the Add Health data. As mentioned above, all friendship nominations were weakly symmetrized. Importantly, each agent has a binary private variable, Ai, which defines if he/she is an adopter (Ai = 1) or a non-adopter (Ai = 0). I allowed each single agent to be the initial adopter, or seed agent, of the innovation and then run the model to evaluate his/her capacity for diffusion. I run these simulations based on the two assumptions described below.

First, I followed exemplary work on the diffusion of innovations (Centola and Macy 2007; Centola 2015) by making the immediate friends or *neighbors*[[9]](#footnote-9) of a given seed agent also be activated (Ai = 1) before each simulation run started. Effectively, therefore, the model evaluates how far a given seed neighborhood (an initial adopter and his/her unique set of friends) can spread an innovation. Second, following a longstanding tradition in the literature on social simulation, I model adoption dynamics using threshold effects (Granovetter 1978; Schelling 1978; Oliver, Marxwell and Teixeira 1985; Macy 1991; Centola, Willer and Macy 2005; Kitts 2006; Dimaggio and Garip 2011). This means that each non-adopter (Ai = 0) decides to change his/her behavior if, and only if, a given proportion of his/her friends has adopted the innovation. The results I show below assume a threshold of 0.25 (i.e. 25% of the friends of a given agent –ego- have to have adopted the innovation in order for ego to adopt the innovation too).[[10]](#footnote-10) The pseudocode of this model is in the appendix.

For this prospectus, I generated a simple measure that captures the average proportion of alters (i.e. agents outside ego’s circle of friends) that are **similar** to ego on a given characteristic (e.g. race) and that end up adopting the behavior when ego is the seed agent. I then calculated the average proportion of alters that are **different** from ego on the same characteristic (e.g. race) that end up adopting the behavior when ego is the seed agent. These two quantities represent the average propensity of adoption among in-group and out-group alters along a given boundary (e.g. race). Since I am able to analyze the behavior of all agents under the same assumptions, no statistical analysis is necessary to conclude that these two numbers are indeed different from each other in Sunshine High.

Table 3 shows that both race and ethnicity are associated with the largest in-group vs. out-group difference in adoption among all the social dimensions under analysis. In other words, race and ethnicity are associated with highly different average propensities of adoption between in-group versus out-group alters. As predicted by the literature, race and ethnicity are indeed the brightest boundaries in this school.

**Table 3. Average Adoption along Key Boundaries. Sunhine High (N=1,452).**

|  |  |  |  |
| --- | --- | --- | --- |
|  | **Average Adoption In-group Alters (A)** | **Average Adoption Out-group alters (B)** | **Difference (A – B)** |
| **Race** | 0.473 | 0.348 | 0.225 |
| **Ethnicity\*** | 0.443 | 0.309 | 0.134 |
| **Grade** | 0.394 | 0.364 | 0.030 |
| **Household income\*\*** | 0.385 | 0.369 | 0.016 |
| **Sex** | 0.384 | 0.368 | 0.016 |
| **Age** | 0.395 | 0.366 | 0.039 |
| **Overall Average Adoption** | 0.368 | | |

\*Latino= 1; otherwise = 0 \*\*Household income was measured in thousands of dollars. This variable is based on three categories: low income (≤35k), medium income (35k < X ≤40k) and high income (>40k)

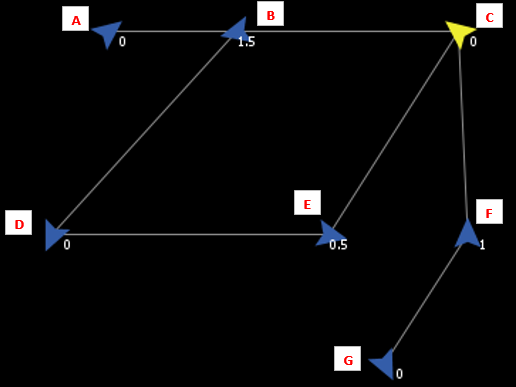
In light of the results above, I decided to further substantiate this proposal by developing a measure of interracial brokerage. The rationale for this is simple: since race is a bright boundary, it is key to develop a measure to identify those agents that have a higher capacity to connect people of different races, people that are otherwise disconnected. Based on the work of Gould (Gould 1988, Gould and Fernandez 1988), I created a measure of interracial brokerage for undirected networks. Here, I define the capacity for interracial brokerage of agent j (the broker) as the total number of *two-step undirected paths*[[11]](#footnote-11) between two individuals of different races (i.e. the ‘terminal’ nodes of the path) on which agent j (i.e. the ‘internal’ node of the path) lies on. These are, effectively, triads with two ties present and one tie absent –the famous forbidden triad of Granovetter (1973)– in which the disconnected nodes of the triad are of different races. In instances in which a given pair of terminal nodes are connected through more than one broker, the capacity for brokerage of each individual broker between the two terminal nodes under consideration increases by 1/p, where p is the number of brokers between the terminal nodes. Formally, I define an actor’s interracial capacity for brokerage IBi as follows:

  eq. 1

Where b(ijk) is equal to 1 if actor i is connected to j, j is connected to actor k, and actor i is not connected to actor k, and 0 otherwise; p(ik) is the number of 2-step undirected paths between i and k, and m(ik) equals 1 if i and k are from different races (or ethnicities, if the focus interethnic brokerage), and 0 otherwise. A hypothetical graphic example of this measure is presented in Figure 1.

In figure 1 all actors are race blue, except actor C. Actor F gets a brokerage score of 1 because she brokers the relationship between G and C, while no other actor connects G and C. On the other hand, actor E gets a score of 0.5 because she brokers the relationship between D and C, but she is not the only broker between these two actors (D and C); indeed, B also brokers the relationship between D and C. Finally, actor B gets a total score of 1.5 since she co-brokers the relationship between D and C (0.5), and she is the only broker between A and C (1). Preliminary regression analyses controlling for age, gender, grade, race, ethnicity, and degree, show that the capacity for interracial brokerage of the agents in Sunhine High is indeed positively associated with being multiracial.

**Figure 1. Interracial Capacity for Brokerage in a Hypothetical Undirected Network.**



Interracial brokerage represents a methodological advancement in terms of how to approximate the idea of bridging cultural holes, which is a contribution to the literature since the theory of cultural holes did not provide concrete measures in its original formulation (Pachucki and Breiger 2010; but see Lizardo [2014] on how to measure cultural omnivorousness). Future work on this chapter will be divided in two fronts. First, I will create robust regression models to predict interracial brokerage paying particular attention to predictors related to the agents under analysis. Second, I will develop analyses to show how focusing on liminal agents can increase the likelihood of diffusing an innovation across racially segregated networks. Here my main aim will be to show that wider patterns of diffusions are associated with scenarios in which the seed innovators are chosen based on features associated with their liminality versus scenarios in which seed innovators are randomly selected from the population of all agents.

**Chapter 2. Liminality and the Social Contagion of Health-Related Behavior** In this chapter I propose to extend the ideas, theory, and findings developed in chapter 1. More precisely, I propose to use stochastic actor based models (Steglitch, Snijders and Pearson 2010) –or other inferential network methods like QAP regressions, ERG models, or Latent Space Models– in order to analyze the role of liminal agents in diffusion processes of health-related behaviors. I will do this using an inferential statistical framework that allows me to show that liminal agents are important for diffusion processes above and beyond well-known homophily effects (e.g. age-homophily, grade-homophily) and well-known selection effects like degree-related effects, reciprocity, or transitivity.

My general argument is that the literature on the spread of health-related behaviors (e.g. obesity, screen time, playing sports, and junk food intake) systematically tends to disregard indicators of liminality like multiracial status or *ambiguous* racial identities like belonging to the “other” racial category, which is not a negligible population. In Sunhine High, for instance, 21.42% of the students described themselves as part of the “other” racial category (see Table 2).

My aim in chapter 2, therefore, is to develop empirical models of the diffusion of health-related behaviors by incorporating measures of liminality using the same schools I analyze in chapter 1. I expect to find evidence in favor of the inclusion of measures of liminality in these models. Such evidence, in combination with the agent-based model developed in chapter 1, should provide enough leverage to argue for the incorporation of liminality in the study of network diffusion processes of empirically segregated networks.

The research question that guides chapter 2 reads as follows: **are culturally liminal individuals associated with wide patterns of diffusion of health-related behaviors?** I will develop models for the diffusion of the following health-related behaviors: obesity, intake of junk food, screen time, and playing sports. Given the primacy (brightness) of the ethnoracial dimension to explain friendship segregation in the US, I expect (ethnoracial) liminality to be important in this regard. The Add Health data incorporates variables that will allow me to measure these health-related behaviors. In fact, there is existent research that has used stochastic actor based models to analyze such behaviors (Shoham et al. 2012; Zhang et al. 2015; Gesell, Tesdahl and Ruchman 2012; de la Haye et al. 2013). Critically, my models will also include brokerage-related measures similar to the one developed in chapter 1.

Some existing evidence might be taken as indicative of the existence of a relationship between (ethnoracial) liminality and diffusion of health-related behaviors in US adolescent and adult populations. Some studies have shown, for instance, that the degree of *acculturation*[[12]](#footnote-12) to the U.S. exhibited by ethnic and racial minorities is associated with unhealthy behaviors. For example, highly acculturated female college students originally from Hong Kong and living in California were more likely to report eating disorders than their less acculturated (female and male) counterparts (Davis and Katzman 1999). Similarly, highly acculturated 6th grade Latino and Asian American students in Southern California report low levels of physical activity and higher frequency of fast-food consumption than their less acculturated peers (Unger et al. 2004).

Recent evidence also shows that the level of acculturation to the US society is positively associated with the tendency of Mexican Americans to both self-evaluate themselves as overweight (Altman, Van Hook and Gonzalez 2017) and to exhibit worse health conditions over time (Martinez, Aguayo-Tellez and Rangel-Gonzalez 2014). More generally, the acculturation of Latinos to the US has also been found to be positively associated with overweight status (Gorman, Novoa and Tolbert 2016). The literature on acculturation is key for this proposal because it highlights the possible existence of network-based influence processes in the diffusion of (un)healthy behaviors where liminality (e.g. 1.5 or 2 generation individuals) might play a key role. Interestingly, this literature is an important reminder that diffusion processes not only entail the diffusion of positive traits.

Finally, it is key to highlight that, despite theoretical calls to do so (Smith and Christakis 2008), the literature on (adolescent) friendship networks and health has not fully engaged in a deeper understanding on the interactions between networks, race and ethnicity, and health. Indeed, several comprehensive literature reviews on: a) peer influence and eating and physical activity (Salvy et al. 2012); b) networks and youth physical activity (Macdonald, Jago and Sterne 2012); c) eating behaviors and body weight (Fletcher, Bonell, and Sorhaindo 2011); and d) youth obesity prevention (Karp and Gesell 2015), contain no meaningful discussion about the overlap between adolescent friendship networks, race and ethnicity, and health. More research is therefore critical in this field. In this chapter I seek to contribute to this literature by providing an analysis firmly rooted in the idea of liminality as described in this proposal.

**Chapter 3. Liminality across Borders in the Americas, 1960-2000. Studying Migration Flows.**

Migrants have to continuously negotiate their identities. Migrants, for instance, tend to be at home nowhere since usually their level of in-betweenness between the host and origin societies is profound (Craith 2012; Clopot 2016). As mentioned in the introduction, migrants continuously have to traverse several cultural spaces thus making them, their families, and their offspring, liminal agents *par excellence*.

I have studied migration of people from the Andean Region to Spain in the past (Leal 2014, Leal et al. 2012; Roll and Leal 2014; Roll and Leal 2010a, 2010b). My collaborators and I have stressed the liminality of international migrants in these publications. We have, for example, made a call to see migrants as cultural and social brokers between two worlds, the host and origin societies (Roll and Leal 2010b). Chapter 3 will extend my previous research agenda by mapping out migration flows of people within the Americas between 1960 and 2000, a very important and large liminal population. I will then fill a gap in the literature on international migration since currently there are *no comprehensive* *accounts* of the migration flows within this region. I argue that doing this is important since international migration flows are the main demographic signature of liminality across borders.

The research questions that gives structure to this chapter reads as follows: **what are the main trends and changes in the international migration flows within the Americas between 1960 and 2000?** Presently, the literature on migration flows within the Americas is overwhelmingly based on studies centered on one country as the source or receiver of migration flows (e.g. migration to Canada), on bilateral flows (e.g. MEX🡪US) (e.g. Garip 2016, Waters and Ueda 2007; Chort and de la Rupelle 2016; Kaushal and Lu 2015; Kritz and Gurak 2015; Flippen and Parrado 2015; Nobles and McKelvey 2015). In a recent series of papers, my collaborators and I have started to provide the much needed comprehensive accounts of migration flows. So far, we have described the migration of women within Asia (Malhotra, Misra and Leal 2016) and around the globe (Misra, Malhotra, and Leal under review). To map out migration flows, we have used an unusually comprehensive data set I developed in 2015-2016.

I produced this data set after gathering and harmonizing relevant demographic and migration data between 198 countries. In terms of the demographic data, I used data on births, deaths, and total population for these countries produced by the United Nations. I also accounted for the costs of migration by including data on the geographic distance between all pairs of countries included in the data set (see Massey and García-España 1987, and Abel 2013, on the use of geographic distance as a proxy for migration costs). Migration stock data, that is, information on the number of immigrants –excluding refugees– living in a given receiving country (e.g. Venezuelans living in Colombia) was obtained from the 2011 World Bank Global Migration Stock Database (Özden et al. 2011). These data are structured in the form of five 10-year stock tables (i.e. 1960s, 1970s, 1980s, 1990s, and 2000s). Effectively, these are weighted sociomatrices (i.e. networks) that, for the first time, provide a global picture of the international migrant (stock) population over the second half of the 20th century (1960-2000).

I estimated migration flows between countries using a state-of-the-art estimation technique, the *flows-from-stock methodology*, introduced by mathematical demographer Guy Abel (2013, Abel and Sander [2014]). In order to use this method, I combined dyadic migration stock data between countries with their respective demographic and geographic distance data. Based on these data, and on the flows-from-stock methodology, I estimated the minimum number of migrant transitions (i.e. flows) needed to meet the changes reflected in any two subsequent 10-year stock tables present in the World Bank Global Migration Stock Database.

The resulting migration flows data set consists of four weighted sociomatrices (1960-1970; 1970-1980; 1980-1990; 1990-2000) that map out the migration flows between these 198 countries across the globe. I will focus on countries in the Americas only. For an in-depth description of the data set see (Malhotra et al. 2016; Misra et al. under review). To analyze these massive amount of relational information I will use *circos* plots (Zhang, Meltzer and Davis 2013), a technique I mastered in my previous collaborations based on these data. I am confident I can carry out the analysis needed in chapter 3 because I myself already developed, validated, and published work from this data set. I believe migrants in the Americas are an important liminal population waiting for a systematic analysis in terms of their migration flow patterns. This chapter will provide such analysis based on new migration flow data within the Americas, information that no other available data set represents as effectively.

**Table 4. Projected Time Line to Finish Dissertation in Weeks (W) & Months**

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Chapter 3.** | **June, 2017** | | | | **July, 2017** | | | | **August, 2017** | | | |
| **W1** | **W2** | **W3** | **W4** | **W1** | **W2** | **W3** | **W4** | **W1** | **W2** | **W3** | **W4** |
| Re-estimate flows with new version of Migest R package |  |  |  |  |  |  |  |  |  |  |  |  |
| Debug code and make sure estimations are reliable |  |  |  |  |  |  |  |  |  |  |  |  |
| First round of analysis based on migration flows |  |  |  |  |  |  |  |  |  |  |  |  |
| Revisit the literature to make sense of data patters |  |  |  |  |  |  |  |  |  |  |  |  |
| Second round of analysis based on migration flows |  |  |  |  |  |  |  |  |  |  |  |  |
| Write; generate circos plots; quick visit to literature |  |  |  |  |  |  |  |  |  |  |  |  |
| Write final version of the chapter after getting feedback |  |  |  |  |  |  |  |  |  |  |  |  |

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| **Chapter 1** | **September, 2017** | | | | **October, 2017** | | | | **November, 2017** | | | | **December, 2017** | | | |
| **W1** | **W2** | **W3** | **W4** | **W1** | **W2** | **W3** | **W4** | **W1** | **W2** | **W3** | **W4** | **W1** | **W2** | **W3** | **W4** |
| Revisit and improve code: degub and validation |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Clean data for two other schools. Include them in model |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Run initial experiments & revisit literature |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Run new experiments & start analyzing results |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Final analysis of results |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Write first version of the chapter |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Write final version of the chapter after getting feedback |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |

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| **Chapter 2** | **January, 2018** | | | | **February, 2018** | | | | **March, 2018** | | | | **April, 2018** | | | |
| **W1** | **W2** | **W3** | **W4** | **W1** | **W2** | **W3** | **W4** | **W1** | **W2** | **W3** | **W4** | **W1** | **W2** | **W3** | **W4** |
| Clean data |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Fit first round of models |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Analyze results & revisit literature |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Fit second round of models |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Analyze results & revisit literature |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Write first version of the chapter |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Write final version of the chapter after getting feedback |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| **I intend to defend my dissertation by the end of May, 2018. I plan to write the intro and conclusion of the dissertation during the first weeks of this month.** | | | | | | | | | | | | | | | | |

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**Appendix. Pseudo-code for the Agent-based Threshold Model in Chapter 1*.***

**FIRST PROCEDURE/LOOP (Populate Model)**

* Extract Add Health friendship nomination network data (e.g. Sunshine High data) and nodes’ attributes data (race, ethnicity, income, age, grade, gender).
* Symmetrize the network using the weak rule.
* Create as many agents as there are in the school under analysis
* Bestow each agent with the attributes (sex, race, grade, income, and ethnicity) of the student it represents.
* Create a variable for each agent, Ai, that signals adoption (Ai = 1 adopted; Ai =0 did not adopt)

**SECOND PROCEDURE/LOOP (Model Diffusion)**

* For agent i to agent n, where n is the number of agents in Sunhine High
  + - * Make agent i the seed agent, that is, the seed innovator (Ai = 1)
      * Make i’s group of friends adopt the innovation. Call this set of agents the seed neighborhood (Si)
      * Repeat N times:
        + In random other, and with no replacement, ask each agent/alter outside Si to:

Adopt the innovation if a given user-defined proportion, T, of her friends have adopted the innovation (T∈ [0,1])

* + - * Retrieve the number of agents infected by agent i. Call this quantity Mi\_raw
      * Calculate the proportion of the population infected by agent i (Mi\_raw/n). Call this quantity the *spreading capacity* of agent i (CAPi).

**THIRD PROCEDURE/LOOP (Calculate Centrality Measures & Average Spreading Capacity)**

* Calculate the following centrality scores for each ego:
  + - * Degree (degi); Betweenness (betwi); Closeness (closei); interracial brokerage (IBi); egonetwork diversity (diveri); Eigenvector centrality (eigeni); Local clustering coefficient (clusti)
* Consider a user-defined proportion *p* of the most efficient spreaders (*p* ∈ [0,1])
* Define the set ϒCAP(*p*) as the portion *p* of agents with the highest spreading capacity (CAPi)
* Compute the average proportion of alters infected for each ego included in ϒCAP(*p*). Call this quantity AVGCAP(*p*)
* Define the set ϒcentrality\_measure(*p*) as the portion *p* of agents with the highest score in a given centrality measure. For instance, the set ϒdegree(*p*) is the portion *p*of agents with the highest degree centrality.
* Compute the average proportion of alters infected for each ego included in ϒcentrality\_measure(*p*). Call this quantity AVGCAP\_centrality\_measure(*p*)

**FOURTH PROCEDURE/LOOP (Compute Imprecision Function)**

* To assess the merit of using a given centrality measure to identify efficient spreaders, one needs to compare the sets AVGCAP(*p*) and AVGCAP\_centrality\_measure(*p*). Following Kitsak et al. (2010), compute the *imprecision function* based on this two quantities:

IMcentrality\_measure(p) = 1 – [AVGCAP\_centrality\_measure(*p*)/AVGCAP(*p*)]

* + Note: A value of IM close to 0 represents a very precise decision process because the nodes chosen under the centrality measure under analysis (e.g. degree centrality) are those who individually contribute most to the diffusion process.

1. In Turner’s words, state refers to “a relatively fixed or stable condition” and would include in its meaning such social constancies as legal status, profession, office or calling, rank or degree. I hold it to designate also the condition of a person as determined by his culturally recognized degree of maturation (…). The term “state” may also be applied to ecological conditions [e.g. state of war], or to the physical, mental or emotional condition in which a person or group might be found at a particular time [e.g. state of good health]” (p. 93) [↑](#footnote-ref-1)
2. Mcpherson et al. (2001: 419) define baseline homophily as “homophily effects that are created by the demography of the potential tie pool.” Similarly, they define inbreeding homophily as “homophily measured as explicitly over and above the opportunity set [of the potential tie pool].” [↑](#footnote-ref-2)
3. To be sure, the borderland is one among many important places in which in-between culture emerges. For instance, Gupta and Ferguson (1992: 7-8) explicitly ask: “To which places do the hybrid cultures of postcoloniality belong? Does the colonial encounter create a "new culture" in both the colonized and colonizing country, or does it destabilize the notion that nations and cultures are isomorphic” [↑](#footnote-ref-3)
4. Cosmopolistanism, according to Wang and Collins (2016: 3) refers to “a set of cultural repertoires utilized by people in a flexible, discursive, and even sometimes contradictory ways to deal with cultural diversity, otherness and the global” [↑](#footnote-ref-4)
5. Following Kitts (2014), social networks can represent, and be measured, as socially constructed role relations (e.g. friendship), interpersonal sentiments (e.g. liking), a pattern of behavioral interaction (e.g. citations) or an opportunity structure for exchange. [↑](#footnote-ref-5)
6. The fact that friendship nominations tend to be reciprocated does not entail that, in the context of a given friendship, a norm of reciprocity fully determines *concrete exchanges* between friends. In fact, a strict norm of balanced reciprocity is more appropriate to describe experimental and observational evidence based on exchanges and economic transactions between acquaintances and strangers than between close friends (Hruschka 2010; Schnegg 2006). In a word, the lack of support for a strict norm of reciprocity (i.e. a strictly balanced, tit-for-tat exchange) between close friends “fits an idea expressed in many places around the world that friends should eschew a norm of reciprocity, focusing rather on friend’s need.” [↑](#footnote-ref-6)
7. Schofield and Withley (1983) discuss the validity of this method of friendship identification [↑](#footnote-ref-7)
8. The rule to weakly symmetrize a directed network is very simple: create a reciprocal (i.e., undirected) tie between nodes i and j if i nominated j or j nominated i as a friend (i <-> j IF i -> j or i <- j) [↑](#footnote-ref-8)
9. Following Centola and Macy (2007: 704) “A “neighbor” refers to any type of social or physical contact—a friend, co-worker, cousin, etc.—and is not limited to a residential neighbor. A “neighborhood” is a focal node plus the set of these contacts, and the size of the set of neighbors is the “degree” of that node.” [↑](#footnote-ref-9)
10. Results are robust to different thresholds. [↑](#footnote-ref-10)
11. A path “is a walk in which all nodes and all lines [i.e. ties] are distinct.” (Wasserman and Faust 1994: 107). A walk is “a sequence of nodes [e.g. agents] and lines [e.g. friendship ties] starting and ending with nodes, in which each node is incident with the lines following and preceding it in a sequence.” (Wasserman and Faust 1994: 105). Finally, the length of a path is given by the number of lines/ties in it. [↑](#footnote-ref-11)
12. “Acculturation is a complex process reﬂecting changes in attitudes, values, and behaviors that occur as the result of contact between individuals or groups from different cultural backgrounds.” (Gorman et al. 2016: 730). [↑](#footnote-ref-12)