

9 Interaction, Diffusion, and Fertility Transition in Costa Rica: Quantitative and Qualitative Evidence

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This chapter examines the role played by diffusion through social interaction in the Costa Rican fertility transition. The literature about the causes of fertility transition has traditionally focused on the socio-economic and cultural determinants of the motivation for having large or small families. To a somewhat lesser degree, it has also considered supply factors limiting or facilitating access to contraception, that is, the role of family planning programmes. The concern here is with the third type of causal agent of fertility transition, that is, the autonomous spread, or contagiousness, of fertility control. If Costa Rican data support the proposition that social contagion processes shaped fertility decline, then an empirical foundation exists for Simmons's (1986: 189) claim that 'programmes may generate their own demand through diffusion from early users to others'.

The earliest fertility studies mentioned the possibility that information flows and the diffusion of ideas contributed towards fertility transition. Caldwell (1982: 128) noted that 'in the late 19th and early 20th centuries, governments and other institutions almost invariably explained fertility control innovationally, as the spread of pernicious ideas'. Diffusionist explanations have re-emerged as a theme in research on fertility transition since the early 1980s, in part as a reaction to the limited explanatory power of theories based on the supply-demand paradigm when confronted by empirical evidence from the Princeton European Fertility Project or the World Fertility Survey (Cleland and Wilson 1987). A lack of conceptual clarity about the meaning of diffusion and the absence of empirical tests have, however, impaired diffusionist arguments. This study aims to overcome both shortcomings. The first part employs a simple dynamic model to simulate a fertility transition process with interactive diffusion effects. The second part examines quantitative evidence suggestive of diffusion effects in the Costa Rican transition. This quantitative analysis is supplemented with an examination of focus group discussions held with women in the cohorts responsible for the Costa Rican fertility decline.

The simplest form of diffusionist argument merely notes that fertility regulation begins in some social groups before others, that is, it 'diffuses'

from one social group to another. A logical next step is to ask whether the spread of birth control can be explained by socio-economic forces alone and, if not, to propose that it is governed in part by another set of forces: 'The timing and speed of fertility transition depend primarily on two factors: economic and social development . . . and diffusion of birth control' (Retherford and Palmore 1983: 295). The most influential example of the dichotomization of socio-economic and diffusionist explanations is Carlsson's (1966) distinction between 'innovation' and 'adjustment'. Under the 'adjustment' explanation, adoption of birth control is a response to changed socio-economic conditions that makes use of already existing behavioural choices. Others who have favoured the 'innovation' position have built their case by citing salient features of the diffusion process per se in Europe and elsewhere, in particular the apparently autonomous spread of knowledge and practice of birth control, the pervasiveness of this process across socio-economic groups, and the character of the transition from high to low fertility as a 'one-time event' (Knodel 1977; van de Walle and Knodel 1980; Watkins 1987). A related study proposes that ideational change rather than change in material circumstances is the driving force behind the fertility transition (Cleland and Wilson 1987), with the diffusion of ideas thus assuming a critical causal role. Freedman (1987) attributes an important causal role to ideas and mental frameworks that spread through national and worldwide communication and transportation networks, although he is less dismissive of the contribution of changes in material circumstances than are Cleland and Wilson. At the extreme, all explanations of fertility change are subsumed within a diffusion paradigm (Rogers 1973, 1983).

This chapter's central hypothesis, that social contagion shapes fertility transition, can be translated into the key proposition that *the adoption of birth control by some individuals influences the likelihood of adoption by others*. Elsewhere, this has been termed 'endogenous feedback' (Erbring and Young 1979). Casterline and Knight (1993) propose three behavioural mechanisms for this feedback process:

1. *Information flow*: when individuals are uninformed about available birth control technologies, early adopters can serve as sources of information for others;
2. *The demonstration effect*: when individuals are uncertain about the benefits and costs of certain fertility decisions, the experiences of others provide concrete evidence of the benefits and costs of the same choices.
3. *Changes in normative context*: when social norms prohibit certain reproductive behaviour, the frequent transgression of such norms can modify the group norms.

These are plausible behavioural mechanisms in pre-transition and transitional societies where some individuals may be ignorant about contraceptive technology, examples of successful fertility regulation are rare, and the prevailing

norms endorse high fertility. In a broader sense, these mechanisms can also act upon values that are critical for fertility change, including gender relations, religious adherence, inter-generational flows of wealth, health values, and so on. The main thrust of the diffusionist argument, as formulated here, is that individuals are not isolated, that they talk to each other and observe each other, and in doing so transmit information, beliefs, and values on reproductive matters.

The focus here is on a particular type of diffusion, generated internally in a system by social interaction. Other types of diffusion processes occur from external sources, for example, through the mass media, marketing efforts of professional propagators, and the institutional spread of propagator agencies (Coleman 1964; Brown 1981; Mahajan and Peterson 1985). By analogy to epidemiology, the focus here is on the spread of diseases by person-to-person contagion rather than by exposure to fixed hazards such as a contaminated well. This focus does not deny the importance of other channels of diffusion. However, externally influenced diffusion can be accommodated within the framework of the demand–supply paradigm, as another factor influencing the costs and benefits of children and the psychosocial or material costs of contraception. Social interaction diffusion, by contrast, adds a further causal dimension: adoption of contraception depends not only on personal and institutional factors but also on the extent to which other individuals have already adopted birth control and the degree of social interaction between adopters and non-adopters.

Modelling Diffusion Effects

Fig. 9.1 shows a simplified model of fertility as a dynamic system. There are three states: natural fertility, latent demand (that is, the existence of motivation to regulate fertility but with no birth control practice), and birth control. Couples flow into and out of this model as they age into and out of the reproductive years and conjugal unions. Motivational or demand forces drive the flow between the states of natural fertility and latent demand, while costs of birth control determine the transition between latent demand and birth control. Socio-economic and cultural forces affect demand. The supply forces comprise cost constraints on the use of contraception, including normative, informational, psychological, and objective barriers: these are the costs that family planning programmes aim to reduce. In pre-transition societies the flow to latent demand is presumably null (or almost null) and the whole population exists in a regime of natural fertility. A shift in the motivation forces may or may not result in a fertility decline, depending on the cost factors. If cost constraints were null, no couples would stay in the intermediate state. Non-null cost constraints keep couples in latent demand limbo, a condition known as the ‘KAP-gap’ (Freedman 1987) or the unmet need for

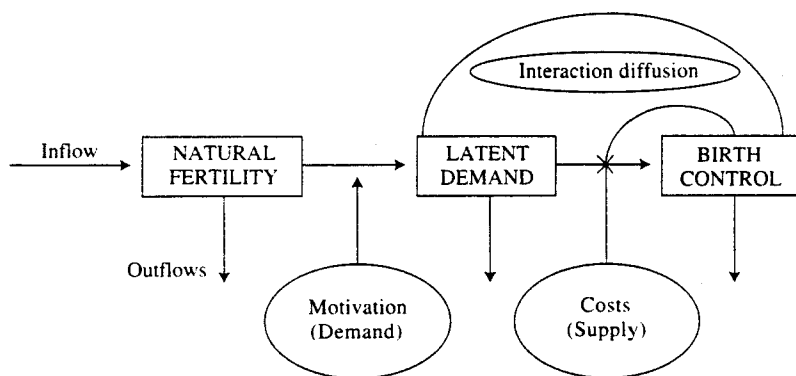


Fig. 9.1. A causal diagram for birth control adoption

family planning (Westoff 1988). Diffusion is depicted as a feedback process whereby the adoption of birth control by some individuals influences the likelihood of adoption by others. The higher the proportion of couples using birth control, the stronger the feedback effect.

Fig. 9.2 illustrates the implications of this model through a fertility transition process simulated with the differential equations implicit in the model (Rosero-Bixby and Casterline 1993). For simplicity, the simulation assumes a stationary population (inflows equal outflows). Rates of demand, supply, and adequate interactions are the inputs for the simulation (lower part of Fig. 9.2). The outputs from the simulation are the total fertility rate (TFR) and the 'KAP-gap' (the proportion of couples in the latent demand state among those motivated for birth control). The lines represent outputs from simulation with no interaction, that is, with null adequate interaction rate. The differences between dashed and solid lines represent the diffusion effects on fertility transition.

The simulation starts from an equilibrium with very low rates of demand, supply, and interaction. Increases in the rates of demand, supply, and interaction are then simulated in years 5, 10, and 15 respectively. In response to the increase in demand in year 5, there is a surge in the KAP-gap, but there is no noticeable effect on fertility. The low supply rate is responsible for these responses. When supply increases in year 10, the decline in both the KAP-gap and fertility starts. The shift in the adequate interaction rate in year 15 accelerates the fertility transition. Until year 15 no meaningful diffusion effect is evident, primarily because the interaction rate is too low. This rate must be low at the outset, otherwise birth control would have already spread from a pre-existent small nucleus of couples controlling fertility to the rest of the population. The difference between the curves with and without interaction indicates a potentially large independent effect of diffusion in both the pace of fertility decline and the post-transition level of equilibrium. In this simulation, interaction diffusion accounts for a reduction in total fertility of almost two births at the new equilibrium level.

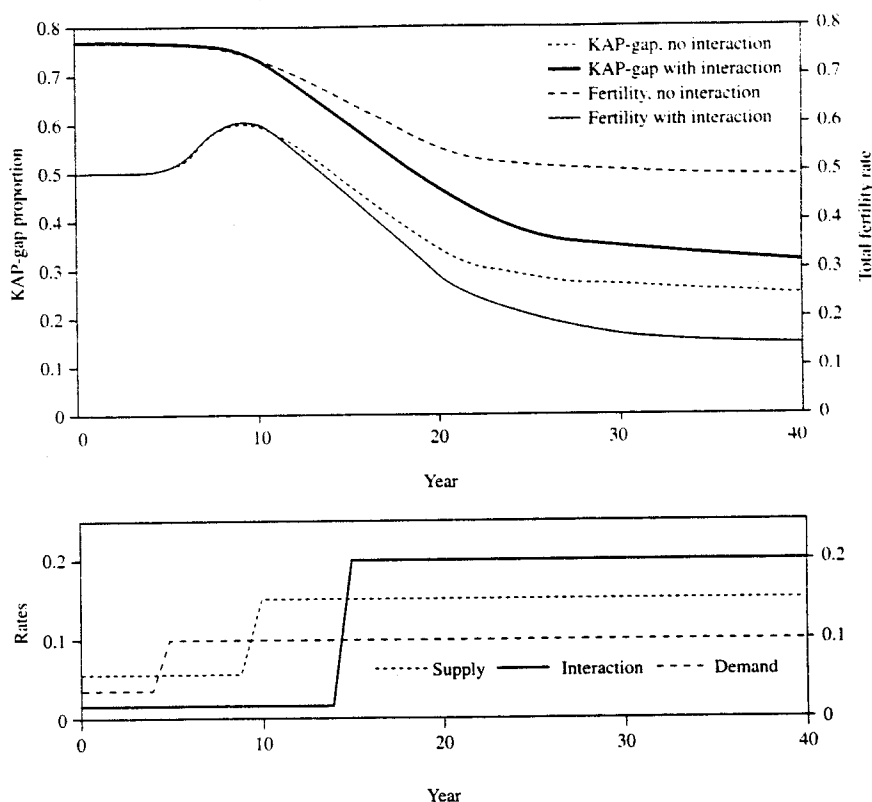


Fig. 9.2 Simulation of fertility transitions with and without interaction effects

Fertility Transition in Costa Rica

Costa Rica experienced one of the earliest and fastest fertility transitions in the developing world. The TFR per woman fell from 7.3 to 5.5 between 1960 and 1968, the year when an energetic family planning programme started, and subsequently to 3.7 in 1976, the year when fertility decline abruptly stopped (United Nations 1985). This reduction of 3.6 births between 1960 and 1976 has been surpassed in similar periods only by Singapore and Taiwan (Coale 1983: table 9.1). During the decade following 1976, however, the TFR fluctuated around 3.7 births, and the contraceptive prevalence rate oscillated around 65–70 per cent (ADC 1987). A trend of moderate decline resumed in the late 1980s, reducing the TFR to 3.3 in 1988. There are six elements in the Costa Rican fertility transition that, taken together, suggest diffusion dynamics:

1. the absence of birth control before fertility transition;
2. limited change in family size preferences during the transition;

3. the rapid pace of fertility change relative to the pace of socio-economic development;
4. the pervasiveness of the decline;
5. the ordered spatial pattern of the decline; and
6. the channels for the spread of information on birth control.

These six elements are considered below.

Pre-transition Fertility

Determining whether birth control was known and accepted before the onset of fertility decline is central in the innovation-adjustment debate (Carlsson 1966; Knodel 1977). Retrospective estimates show that by 1960, the total marital fertility rate was about eight births per married woman, the average length of breastfeeding was less than six months, and the contraceptive prevalence rate was 16 per cent (Rosero-Bixby and Oberle 1989). This high level of marital fertility is not compatible with generalized birth control practices. The relatively short average duration of breastfeeding is partly responsible for this high marital fertility. The contraceptive prevalence rate of 16 per cent, although low, suggests the existence of strata in which birth control practice was common—the emerging urban middle classes (Rosero-Bixby *et al.* 1982). It is not clear why birth control did not diffuse from these strata to other social groups before 1960. Some analysts suggest that the event triggering diffusion was the commercial introduction of oral contraceptives in 1962 and the corresponding attention given to the new contraceptives by the media (Tin and Reynolds 1972).

Family Size Preferences

Surveys carried out in Costa Rica during the course of the fertility transition show little change in family size preferences. In the first urban fertility survey, held in 1964, women younger than 35 stated a desired family size of 3.9 children. The corresponding average for the first rural fertility survey, held in 1969, was 4.6 children. Retrospective cohort-specific estimates indicate that average desired family size for women aged 20–24 in 1954 was 3.9 children in urban areas and 4.5 children in rural areas (Rosero-Bixby *et al.* 1982), that is, similar to the averages for 1964 and 1969. As of 1986, the desired family size had declined by less than a child, to 3.1 children in urban areas and 4.1 children in rural areas (Hermalin *et al.* 1989). Thus, there is no evidence of a downward shift in fertility preferences in the decade prior to the fertility transition, nor was the substantial decline in fertility accompanied by a decline in preferences of a corresponding magnitude. The contrast between the change in family size preferences and the sharp decline in fertility suggests that motivational theories alone have only a limited explanatory power in Costa Rica.

It seems that for some time Costa Rican women had wanted families of moderate size but had large families. A 1964 survey in San Jose shows 47 per cent of the respondents both expressing a desire to regulate their fertility and not using contraception, and in a 1969 survey in rural areas this proportion is 78 per cent (Gomez 1989). These figures leave no doubt about the existence of a substantial KAP-gap during the early years of the Costa Rican fertility transition, especially in rural areas. However, by 1976 the comparable figures were 32 per cent in urban areas and 38 per cent in rural areas, and by 1986 they were 20 per cent and 27 per cent respectively. This sharp fall in the KAP-gap suggests that factors other than motivation, such as increased availability and acceptability of contraceptives and the interaction diffusion effects, made a major contribution to the Costa Rican fertility transition.

Relative Speed of the Decline

Fertility in Costa Rica fell by some 50 per cent between 1960 and 1976. In this period, and immediately before, the country's economy grew substantially. Real growth in the Gross Domestic Product was 6.5 per cent per annum in the 1960s and 1970s (Lundahl 1991). The pace of social development was even more dramatic than that of economic growth. Stycos (1982: 17–18) singles out increased schooling as a principal cause of the fertility decline:

Between 1950 and 1963 and again between 1963 and 1973, there were huge increases in the proportion of young women completing primary education: from 22 per cent in 1950, the proportion rose to 40 per cent in 1963, and to 72 per cent in 1973 . . . by 1963 both the pervasiveness of literacy and the substantial increases in the proportion completing elementary school might, indeed, have signalled the fertility decline of the 1960s.

These rapid increases in income and educational attainment undoubtedly stimulated the spread of birth control behaviour in Costa Rica. But several efforts to quantify their impact suggest that these factors explain just a small part of the fertility decline. One study concludes that 22 per cent of the fertility decline between 1960 and 1970 is attributable to improvements in schooling (Behm and Guzman 1979). Another concludes that changes in educational attainment, occupational structure, and women's employment together explain 22 per cent of the fertility decline in urban areas and 15 per cent in rural areas during the periods 1961–73 and 1966–73, respectively (Rosero-Bixby *et al.* 1982).

Pervasiveness across Socio-economic Strata

The failure of socio-economic changes to explain a large fraction of the fertility decline simply reflects the fact that all socio-economic groups participated in the decline. In the early 1960s, socio-economic differentials in fertility were substantial and widening (Behm and Guzman 1979). Fertility

decline began, and initially was limited to, the urban middle classes, particularly the more educated groups. By the 1970s, the process had reached all strata and even wives of farmers had begun to adopt contraception (Rosero-Bixby *et al.* 1982; Stycos 1982). The rapid spread of birth control practices to all socio-economic strata is one of the most striking features of the Costa Rican fertility transition. A pattern in which innovative behaviour first adopted by an elite rapidly pervades all strata is strongly suggestive of the causal role of social contagion in determining the timing and pace of decline, and it raises doubts that socio-economic structural changes are sufficient to explain the course of fertility transition in Costa Rica.

Spatial Spread

The evolution of geographic differentials in fertility was analogous to the evolution of socio-economic differentials: they increased at the beginning of the transition, reaching a peak around 1966–7, and then narrowed (Klijzing and Taylor 1982). A study of spatial patterns found that 'Adoption of birth control occurred first in the nation's main innovation centre, San Jose, and gradually spread toward the periphery' (Fridman 1984: 169). The pattern of the spread of birth control practices to all areas of the country is again suggestive of the contribution of interaction diffusion dynamics.

Fig. 9.3 summarizes the temporal and spatial pattern of the onset of fertility transition in Costa Rica. In Fig. 9.3a, the 100 Costa Rican counties are shaded according to the period during which general marital fertility (F) fell below the threshold of 0.35 (Rosero-Bixby 1991). ('Counties' are areas that combine the Costa Rican administrative units of *cantones* and *distritos* for the purpose of making comparisons over time and having geographically and socially meaningful entities.) In Fig. 9.3b, the observed threshold years are smoothed using the trend-surface technique (Cliff and Hagget 1988). These maps suggest that the transition began in the central and north-eastern part of the country and then spread quickly through a corridor running parallel to the Pacific coast. In the trend-surface map, the first wave of fertility decline is just an extrapolation from the north-east Central Valley to sparsely populated areas. The first meaningful wave in the map (threshold years 1965–6) encompasses the Central Valley and the northern half of Limon province in the east. During the two years following this wave, the fertility decline spread as far as 120 kilometres to the west. These first waves cover vast areas of the country, and are indicative of rapid spread. After these early waves, however, the fertility transition moved much more slowly towards the north (Nicaragua) and east (Panama), advancing only about ten kilometres every two years. The narrow bands of progress in the 1970s suggest the existence of barriers to diffusion, which were probably of a cultural nature, given that the population in those areas is in many aspects culturally closer to the neighbouring countries than to the population in the Central Valley. The spatial order evident in

the maps in Fig. 9.3 suggests that social interaction diffusion, through contact between adjacent areas, might have contributed to the timing of the Costa Rican fertility transition. The spatial pattern is not, however, conclusive evidence of diffusion. It may reflect nothing more than the spatial patterning of demand and supply factors.

Channels for the Spread of Birth Control Information

Fertility survey data on how Costa Rican women first learn about contraception show that interaction with friends and relatives has been the most important channel (Table 9.1). From one-third to two-thirds of women in different cohorts learnt about family planning in conversations with friends and relatives. In the very earliest stages of the transition (before 1964), urban women stated that this information came mostly from their husbands: it is highly probable that, in turn, most men obtained similar information from friends. Health providers were the second most important source. Their importance peaked (at 30 per cent) among the cohorts of women who adopted family planning in the late 1960s and early 1970s—the golden years of the national family planning programme. The mass media do not appear in these surveys to have been an important vehicle for spreading the family planning message. The data also show that younger generations are shifting to mothers and formal education as sources of family planning information, a logical result given the arrival at reproductive ages of the second generation of family planners, and given also the institutionalization of sex education in formal education. While the figures in Table 9.1 are not proof that person-to-person

Table 9.1 Distribution of persons from whom respondents first learnt about contraception, Costa Rica, 1964–1992 (%)

Survey and age at survey	Mother	Husband	Friends/relatives	Health provider	School/courses	Media/readings
1964: Urban						
20–49	2	54	23	19	n.a.	1
1969: Rural						
35–49	2	10	55	23	1	9
25–34	1	9	56	22	2	10
15–24	1	2	67	12	4	13
1992: National						
35–49	7	3	37	30	14	10
25–34	11	2	32	18	32	6
15–24	25	2	36	7	26	5

n.a. = not available.

Sources: Gomez (1968: table 70); original data file of the 1969 PECFAL rural survey; CCSS (1993: unpub. tables)

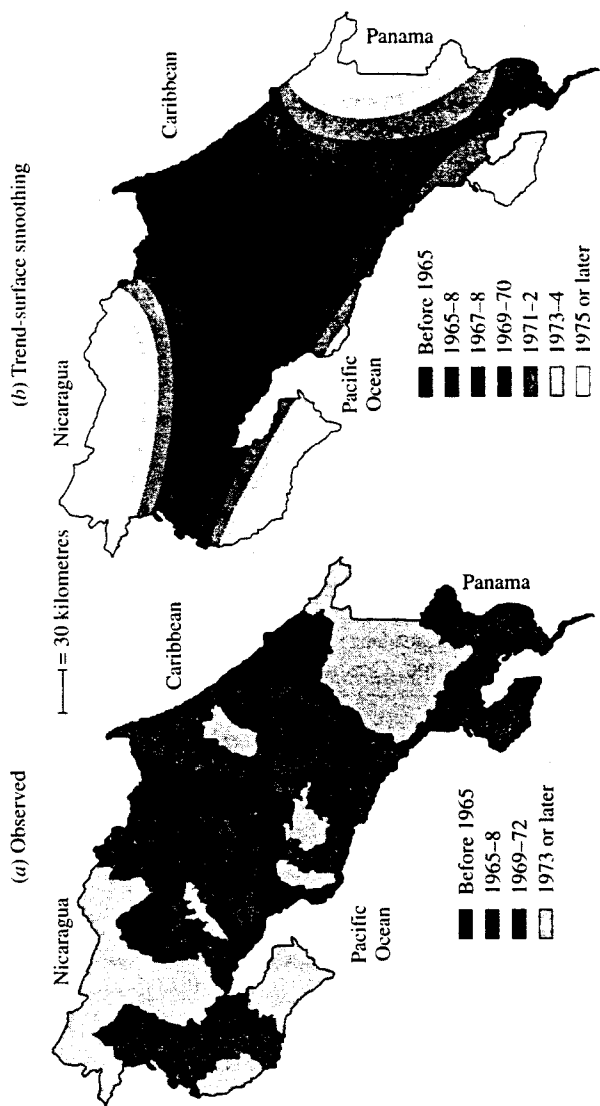


Fig. 9.3 Year in which countries surpassed the fertility threshold, $f = 0.35$

interaction was the efficient cause for the adoption of birth control, they do suggest that substantial person-to-person contagion of the idea of birth control is plausible.

Macro-level Estimates of Diffusion Effects

A rigorous econometric analysis based on pooled time series data for 100 Costa Rican counties during the period 1958–88 supports the interaction diffusion hypothesis (Rosero-Bixby and Casterline 1994). Similar econometric analyses for Taiwan also support the possibility of interaction diffusion effects in addition to socio-economic and programmatic influences (Montgomery and Casterline 1993). Two types of diffusion effects were estimated for Costa Rica: within-county and inter-county (Table 9.2). Within-county effects interact with social and geographic compactness, that is, the homogeneity, of the county. Inter-county effects interact with an indicator of a county's openness to the outside world. Table 9.2 shows the estimates from two statistical formulations. Both sets of estimates make allowances for the possibilities of correlated errors within each time series, non-constant variance from one cross-section to another, and endogeneity of dependent variables. The GLS-IV estimates refer to models based on generalized least squares with instrumental variables. The second set of

Table 9.2 Interaction diffusion effects from regressions on pooled time series data for 100 counties, Costa Rica, 1958–1988

Birth control proportion	GLS-IV model		GLS-IV-DEV model	
	Within-county diffusion (compactness)			
	Low	High	Low	High
0.00	1.00	1.08	0.35	0.32
0.20	0.65	0.73	0.19	0.16
0.40	0.30	0.38	0.03	0.00
0.60	-0.60	0.02	-0.13	-0.16
	Inter-county diffusion (openness)			
	Low	High	Low	High
All	0.31	0.36	0.50	0.46

Note: Effects controlled by indicators of socio-economic development, child mortality, social security coverage, access to family planning services, a linear time trend, and pre-transition fertility level.

Source: Rosero-Bixby and Casterline (1994).

estimates, GLS-IV-DEV, result from re-expressing all variables as deviations from county-specific means. This procedure removes possible correlation of errors with socio-economic and programmatic characteristics of counties, but it also loses considerable statistical power and amplifies random errors in the data.

The GLS-IV estimates of within-county diffusion effects imply that in less compact counties (socially and geographically) in which 20 per cent of couples are practising birth control, a one-point increase in this percentage will stimulate a further 0.65-point increase in the next time period because of ideational contagion. The comparable figure in counties where 40 per cent are exercising birth control is 0.3. Inter-county diffusion effects are not, under the model employed in this analysis, conditional on the prevalence of birth control: according to the GLS-IV estimates, a one-point increase in the percentage practising birth control in other relevant counties (average weighted by amount of social interaction with the index county) leads to a 0.31-point increase in the index county in the next time period. The GLS-IV-DEV estimates, which are theoretically sounder, yield weaker within-county effects, higher inter-county effects, and non-significant interactions with compactness and openness. Substantial and significant diffusion effects persist after tests, although the magnitude of the effects varies with the estimation approach.

Both sets of estimates indicate that within-county diffusion effects are stronger in the early phase of the fertility transition, when the prevalence of birth control is low. The declining importance of diffusion in part reflects the exhaustion of the pool of potential adopters, but it may also reflect the greater salience of the social interaction mechanisms described above—information flow, the demonstration effect, change in normative context—in the early stages of transition. As the transition progresses, the information flow and demonstration effect may shift to external agencies (family planning programme IEC efforts, medical counselling) and social institutions (family and school). According to the GLS-IV estimates, within-county diffusion effects disappear when the proportion of birth control reaches about 0.6; the comparable figure for GLS-IV-DEV is 0.4, which is rather low. The Costa Rican data do not support the hypothesis that diffusion effects are conditional on the internal homogeneity of an area or on the openness of the area to the outside world.

These estimates of the multiplier effect of ideational contagion of birth control are important given the lack of rigorous analysis of most diffusionist explanations. However, the estimates presented here are only indirect evidence of traces of diffusion effects. From another perspective, the qualitative evidence presented below gives some real-life support to the theoretical and econometric claims of interaction diffusion effects.

Qualitative Evidence from Focus Groups

Is the interaction diffusion hypothesis plausible in real-life situations? Qualitative data from focus group sessions were collected in November 1993 to help answer this question. Six sessions were organized as follows: two in a popular neighbourhood of San Jose, the capital city of Costa Rica; two in small conservative towns of the Central Valley (Puriscal and Orosi) and two in less conservative towns in the lowlands (Santa Cruz and Canas). Participants were middle-class Costa Rican females (eight per session) aged 45–59 with at least one child and some experience in birth control methods. Most were housewives and had completed elementary school.

A characteristic of the focus group participants is that they lived through Costa Rica's fertility transition: they started their reproductive lives under natural fertility and ended under controlled fertility. Moreover, analysis of age-specific fertility rates shows that the cohort of women born between 1930 and 1945 (aged 45–59 in 1990) were responsible for most of the fertility shift in Costa Rica (see the italicized figures in Table 9.3). Older and younger cohorts added little to the fertility decline brought about by this cohort. Two women psychologists conducted the sessions. They had considerable experience using this technique in marketing studies. The present report is based on direct observation and notes taken at the sessions, the transcripts, and from listening to tapes of the sessions.

The focus group sessions addressed the following major topics: (1) change in family size and its causes; (2) family size preferences; (3) social norms about family planning; and (4) the diffusion (learning process) of family planning.

So as to provide a context, we first examine the determinants of change from large to small families and the adoption of family planning. In addition to interaction diffusion matters and personal experiences with contraceptive methods, the discussions mainly considered five topics:

1. sex education and access to contraception;
2. health;
3. gender relations;
4. religious issues, and
5. socio-economic factors.

According to the focus group participants, these are the five dimensions affecting reproductive decisions, particularly the first three. The impression from the focus group discussions was that in the eyes of the participants, the fertility shift that they had witnessed was driven less by socio-economic factors than by ideational changes (sex, health, gender relations, and religion), as well as by an increased supply of contraceptives.

Table 9.3 Age-specific fertility rates and their percentage of change per quinquennium, Costa Rica, 1960–1985

Age	1960	1965	1970	1975	1980	1985
Fertility rates (per 1,000)						
15–19	122	111	102	104	107	103
20–24	357	305	239	207	200	197
25–29	354	318	231	178	181	180
30–34	297	256	188	130	130	135
35–39	223	215	144	92	81	83
40–44	89	88	69	40	31	30
45–49	16	16	12	7.90	5.30	3.60
TFR	7.29	6.55	4.93	3.79	3.68	3.66
Percentage of change						
15–19		–9	–8	2	3	–4
20–24		–15	–22	–13	–3	–2
25–29		–10	–27	–23	2	–1
30–34		–14	–27	–31	0	4
35–39		–4	–33	–36	–12	2
40–44		–1	–22	–42	–23	–3
45–49		0	–23	–36	–33	–32
TFR		–10	–25	–23	–3	–1

Source: Rosero-Bixby (1991: table 9.2).

Sex Education and Access to Contraception

The focus group discussions about why people had many children in the past and why they have few today always revolved around the lack of contraceptive methods and the ignorance about sex in the past. The following are typical and frequent explanations of the high fertility in the past.

I would say that it was mostly because of ignorance and partly due to lack of means. Families were filled with offspring because they didn't have any knowledge about birth control.

In the past, families were larger than right now, because in the past one didn't know about birth control like now . . . we went that way . . . having each surprise . . . this month I got my period, the next month I didn't. Each offspring surprised us because we did it and the last thing one thought was that one would end up pregnant.

My mother-in-law says that she wouldn't have liked having all the children she had. She would have liked four, three less than what she has. She didn't use contraception, not because she didn't want to, but because she didn't have a choice.

There were generalized complaints about ignorance of sex and reproductive matters, linked to the central topics under discussion—family planning and family size. Reproductive matters were portrayed as taboo at the time

participants got married. There was no sex education. Many participants spontaneously talked about their first menses (how little they knew about it) to stress their lack of sex education and communication with their mothers. There was a sense that family planning was an innovation—a critical factor in most diffusionist arguments.

I think that it was ignorance about family planning. It was taboo to talk about it. Women got married and they didn't know what they were getting into.

My mother was so strict that when I got married I didn't know how babies were born. One was told it was through the stomach, that they opened up your stomach.

We were eleven and my mother elderly. I was among the youngest and she never had a good relationship with me. I respect and love her but she never talked to me about sex, not even about menstruation. When I got my first periods I was among nuns . . . it was the most frightening experience a woman could have!! I was very ignorant about sex, even when I got married I knew nothing about it.

I got married at 16 and I didn't know anything about menstruation. My mother used to say, 'They are going to scare you, they are going to scare you' . . . one was naïve. Mom never told me anything. I got married and I knew nothing about contraception.

I was naïve about that subject. Not even in my senior year did they talk about it. We learnt biology but never family planning. I knew about it when I got married and visited the gynaecologist.

Paralleling the complaints about the past, there was also a sense that the situation has changed, that nowadays people are more open about reproductive matters, that there is more communication with mothers, and that children are receiving some sex education. These changes in attitudes and values towards sex and reproduction were mentioned as part of the explanation of the fertility decline that participants had lived through. To diffusionists, such changes suggest that an increased 'interaction rate' might be a factor in the transition.

Nowadays mothers tell their children everything. I remember one day I told my mother that a neighbour had a baby and she said, 'Yeah, some people passed by here, they offered it to me, but I have you, more children, no.' I didn't notice her belly nor did I have a clue, now they tell her children [pointing to her belly]: 'Here's your brother.' My mother also never told me anything about menstruation. When I got it for the first time I was so scared. Now girls at school and everywhere talk about it.

Health

Health indicators in Costa Rica are better than might be expected given the country's level of economic development (Rosero-Bixby 1993). For example, life expectancy at birth was 75 years in 1990, similar to that of highly developed countries. Health in Costa Rica, together with education, is highly valued, not only in public policy but also in the private lives of the population. Participants in the focus group discussions frequently raised issues relating to

health and linked these to family size and to decisions on contraceptive use. One way in which participants linked health to reproduction was in its classic role as provider of contraceptive methods and advice on demand. This is the role one expects family planning programmes to play.

I had heard about family planning but not much. Sometimes one reads a newspaper, or listens to a radio programme, but I didn't know about contraceptives, and didn't give it much thought until the doctor called for a talk and explained to me what method I could use. I started to use the IUD, he gave me the knowledge about what I was getting into, and from then on I used birth control. I think I once saw a pamphlet at the clinic.

I got married, had three daughters and never used contraceptives. When the third one was born, it was a very painful delivery and I got scared of having more children, so I got the injection every month for some time. Afterwards I used pills. When I got older my gynaecologist took me off everything. Oh well I also used the copper T when he took it off, I was afraid to have another child.

Often participants stressed that the motivation for practising family planning came from health concerns, including consciousness about their bodies. An increased appraisal of people's health and bodies might thus be an ideational change propelling fertility decline.

I was afraid of morning sickness, so I told my husband that we had to find a way not to get pregnant.

He said that he wanted me to have only two kids. I agreed because I was sick when I was pregnant (like Teresa). With the youngest I spent six months throwing up, my tummy was small, and when my daughter was born, she weighed only six pounds and five ounces. I thought: 'Why am I going to have more? The next ones won't even be born'.

After I got pregnant with my youngest daughter, I went to the doctor and asked him for the operation. He asked why, and I told him that I didn't want any more children and that the pills are making me fat.

Contacts with the health system also seem to have been decisive for some women in deciding whether to use birth control. Improved availability of health services and an increased use of these services (especially pre-natal and delivery care) might also be factors contributing to fertility transition.

Usually after the birth of your first child you'd go to the Health Child Care, and there they'd tell about birth control, it was 24 years ago.

After I had my first son, the doctor told me about birth control. It wasn't only nurse Carmen who told me about it, but also the paediatrician who examined my child.

When I was pregnant with the oldest, a nurse asked me if I'd thought about birth control. I told her I had, and she said to come back after the baby was born for some contraceptives.

Some health providers were also community leaders. They reached out to the population to promote family planning. In one of the focus groups, all women were encouraged to use family planning by Dona Carmen, the nurse in charge of the Health Centre for many years.

I learnt it through the Health Centre. Dona Carmen always went to your house and talked about it. She was a social worker or nurse, she visited, guided and helped you.

Health considerations also provided some women with an excuse for practising birth control and overcoming the opposition of relatives, religious fears, and their own preference for having large families.

I would have liked to have more children. I have three but had terrible morning sickness. After my first two daughters I said I wouldn't have any more. My husband agreed because he saw how bad I felt. But he always wanted a boy, and when the youngest girl was 9 I decided to take the risk and I had a boy. Then I said, this is it, because even after that many years, I had a very bad pregnancy.

Gender Relations

The issues of *machismo* (assertion of masculinity by having many children) and subordination of women in the household came out many times when participants explained why families were large in the past. Men often appeared as wanting many children and imposing their will on women. Some participants pointed to *machismo* as the motivation for this behaviour. In several cases, however, men's motivations were not explicit.

I had to use birth control behind my husband's back because he wanted me to have a child every year. I don't know why he always wanted to see me pregnant, with lots of children, always taking care of them, breastfeeding them.

Machismo! Men felt more men if they had lots of kids. The more the better. I knew a man (my son's godfather), who used to say to his wife, 'You have as many kids as God wants to send you: the day I know that you are avoiding them it's all over between us. *'Machismo* here means the more children you have, the more man you are.'

Sometimes husbands were very sexist, they said that you had to have the children God sent you . . . even if there had been no birth control then, they wouldn't have let their wives use it. My father wouldn't have allowed my mother to do it.

When she complained she was pregnant for the seventh time, the husband said, 'What, do you want to have kids with another man?' It was not the fact that the man wanted more children, he didn't care about anything.

I think mothers were very dependent on their husbands. They expected them to take the initiative and decide when to use contraception. If the husbands did not say anything, the women did not do anything either.

Paradoxically, in spite of complaints of *machismo* and subordination, many participants felt that they had considerable autonomy and a good measure of co-operation from their husbands. Participants in the focus groups witnessed an important change in gender relations. *Machismo* appeared to be declining throughout Latin America (Stycos 1981). Several participants noted the change.

It depended on the husband: mine helped me. When he came home from work he helped me. . . but some men don't help their wives.

Before, husbands left all the responsibilities to their wives. She had to take the children to the hospital by herself, she had to do everything. Now husbands help to give the kids baths and take care of babies. My husband used condoms, but I didn't like them because they hurt me. He asked the doctor and he gave me a prescription for pills.

The husband was the one who taught you. You were very submissive. It's not like that now; if they tell you not to go out, you say, 'No, no, no I'll be right back, stay here for a while.'

We were very submissive to our husbands, I think that for most women, everything was how he wanted it. It's not like that anymore. We both work now. My husband would help me if the kids got sick.

Religion

Many of the focus group participants contended that religious norms were an important obstacle in practising family planning in Costa Rica, especially in the past.

She'd lost a baby and she'd had difficult labour. The doctor warned that she'd die if she went through labour again. She talked to the priest and he told her, 'I'm sorry but I can't allow you to do that, if you get pregnant and die because of it, then you die.' And the woman died.

In the past, birth control wasn't widely used. I remember when I got married at 14½. God forbid! I read in the newspaper that the Pope prohibited birth control. The woman that used it was out of the Church. I used birth control only after my fifth child.

However, some couples adopted contraception in spite of their religious concerns. Couples coped with their concerns by not carrying out some religious practices, such as going to church, communion, and confession. Some women managed to find a priest who allowed them to use contraception. A few stuck to abstinence. The first-hand testimonies from the focus group participants are important in understanding how a predominantly Catholic population, in a society in which the Catholic Church has a great influence, came to adopt modern contraceptive methods en masse despite resistance from the Church. According to the 1992 Reproductive Health Survey, the contraceptive prevalence rate in Costa Rica is 75 per cent, and 68 per cent if one excludes abstinence (CCSS 1993). Moreover, there is no association at all between religiosity (church attendance) and contraceptive prevalence. There is an association between method mix and religiosity: women who go to church weekly are much more likely to use natural contraception and sterilization than women who never go to church. These figures, and some of the evidence from the focus group discussions, suggest that a secularization process (Lesthaghe and Surkyn 1988) might have played an important part in the fertility transition in Costa Rica.

Disobedient! We don't listen anymore. They're not going to help raise the kids, to educate them or to support them. The priest can talk all he wants, it doesn't matter

. . . . I used birth control and didn't ask the priest's permission. I just discussed it with my husband. I haven't felt guilty.

You go to Mass but don't take communion because you feel that you are not doing the right thing. At least I felt that way. It's not right . . . but you have to do it because of necessity.

I used condoms and I went for confession and told the priest because I had the idea that it was a sin. He told me that if I was going to keep on doing it I shouldn't go back to confession. So, I didn't go back.

I went and told the priest that I was using birth control because of my age, it was very risky. He said not to worry. It depends on the priest.

Socio-economic Factors

Participants in the focus group discussions made only a weak link between material living conditions and their reproductive decisions. Motivational factors, emphasized by some theorists as important for fertility transition, such as old age support, replacement of child mortality, and survival strategies of the poor, did not emerge in the discussions in spite of attempts by the moderators to bring them into focus. However, some participants linked the adoption of birth control to standards of living, and in particular to their aspirations for a better life for their children.

You say to yourself: I've come this far and I want my children to go farther. If you have many children, they'll have less opportunities . . . that happened to my husband. They were so many that the oldest had the chance to study and the others had to work.

In the past one had many children and there were many difficulties. Now you want to live, not in luxury, but at least to have enough. I think that's why there are less children. Couples worry more about giving them an education, and life is expensive, and they look for a way to keep the family small . . . And maybe other couples say, 'I'm not having lots of children. God forbid. There's the house, the fridge and living well' They want to have a lot of things before the children.

Of interest in considering the role of socio-economic factors was that some participants tended to link them to men's, rather than women's, reproductive behaviour. This suggests that the determinants of fertility transition in Costa Rica, and possibly elsewhere too, might be gender-specific. Demand or motivational forces may be more important among men, while supply or costs of contraception may be more salient for women. The present research did not conduct focus group discussions with men.

No, I wanted what God sent me, but my husband said that if we had lots of children they might go hungry, like it happens in many families. So it was better to have fewer and take better care of them.

My husband did plan the family. He said: 'I'm going to work like a horse when I have my four kids, if God gives them to me and you can have them, but after that I'll put on twenty condoms if necessary, but I won't be having more. I'll be 45 and I'm going to have just one job to be with them.'

I wanted to have about ten. But my husband thought more carefully about it. I was very young, 18. He said it was not a good idea to have too many, that it was better to give them a good education. Maybe I did not think about it because I was young and inexperienced. He was 24 and had to work since he was very young. He said that children were too expensive. I had five and one died.

There were frequent remarks about the burden of baby-sitting siblings as a key factor for wanting a small family. This is a little-studied causal link between increased child survival (and the subsequent enlargement of families) and the fertility transition.

I always told my husband that I wanted just three children because at my house there had been so many kids and I practically had to raise them since my mother was a teacher and had to work. Well I got so bored of them that I always said three kids.

My mother had two pairs of twins and a lot of other kids. I would come home from school and had to go pick coffee and help my mother to sew because we needed the money to raise so many kids. It was changing diapers and washing all the time. And I got the idea that having a lot of kids was a kind of slavery. We don't want that now.

Qualitative Evidence on Interaction Diffusion

The focus group sessions brought to the fore substantial evidence of interactions on reproductive matters, and of potential causal links between these interactions and the adoption of birth control. The discussions also provided information about the content and circumstances of these interactions. There were also many circumstances in which interaction diffusion had little, if any, connection with the adoption of birth control. Moreover, the very dynamic of the group mirrored the presence or absence of person-to-person communication on reproductive matters. Some groups were outspoken, but others were reluctant to talk about family planning. In the latter, family planning was reported as a private matter about which some participants were shy to talk.

The most obvious interaction was the exchange of information about family planning methods. These exchanges included information about the existence of specific contraceptive methods, their characteristics and effects, and the places to obtain them. There were also exchanges of printed materials and even of the contraceptives themselves.

I had several sisters-in-law. All of us had lots of children. We used to talk about preventing pregnancies or spacing them. They said that the clinic prescribes pills or douches with acids.

I used the injection. A friend recommended it, saying that it lasted one to three months. You get it and don't have to take pills every day.

From listening to the comments of other women in groups that one goes to. Sometimes we sat there just to talk and we would ask each other how we prevented pregnancies. Some mentioned condoms, some IUD, it was kind of a coffee talk. My sister told me she was going to use IUD because it was said to be a very effective method, and you don't have to take pills every day. We have varicose veins and pills don't help. She went to a talk at the clinic and got it. She told me that it was kind of a wire with something hanging.

Some friends would give advice to one another. That condoms were not convenient for the men's satisfaction, it's not the same feeling, pills were better. Then somebody else would say that pills fatten, are easy to forget or cause nausea.

Participants had little to say about interpersonal communication on family size preferences when the moderators brought up the topic. It seems that the desire for having small families among the participants and their mothers was so obvious that they do not remember relevant discussions with friends or relatives on this topic. The following example about this type of interaction was exceptional.

In high school we used to talk about every girl's dream . . . to get married, have a husband, have children, but not very many, only a couple. Some girls even cover their notebooks with pictures of children and would name them, since they were the children to come.

By contrast, there was substantial evidence of interaction that gave rise to group support for adopting family planning. For some participants, using birth control for the first time produced anxiety of the unknown, religious fears, and concerns about their husbands' opposition. Interactions with friends and relatives helped them cope with these fears. In some cases, friends and relatives even exerted a little pressure on the undecided.

Since I had so many kids, people would tell me, 'Dinora, why don't you use birth control?', I used to tell them 'I'm afraid.' I was scared that when I bought the first pills without a doctor's prescription, my period did not come for a month.

I went to the clinic by myself and got the IUD (it cost me 25 colones). I had been advised by friends, you know, gossip. My husband got really mad when he found out. Maybe he thought that it was something wrong. He thought that if I used it I was going to fool around with lots of men.

I realized about it when I was going to get married. My workmates told me, 'You can't have kids so soon, you have to get used to married life, it's better to use contraception.' I went to a doctor. He sent me for a blood test to see how I was and if I could take pills to prevent pregnancies. That was the way I used birth control before I got married.

There were also cases where friends actually provided the means to gain access to family planning methods.

I never had the knowledge, not even about the pill. I had six children in seven years. When my seventh child was born, one of my husband's cousins, who worked at the hospital, told me. 'Dulce, it is not possible, you having six kids in seven years. I'm

going to write a letter.' She did that and made her husband sign it as if he were my husband. After I gave birth she handed the letter to the doctor Alvarez and two days later I was operated. . . . I did it behind my husband's back. Since the person who helped was his cousin and she was a nurse, she explained it to him and he said it was OK.

The evidence from the group discussions substantiates the plausibility of person-to-person contagion in the adoption of birth control. Women talked to each other about family planning and in these interactions they exchanged information, gave and received advice and support, even a little pressure, facilitating and motivating the use of contraceptives. These interactions did not always happen. For some participants, family planning was something private, something that one did not talk about publicly.

Family planning talk was very private, it was almost a secret. One was so foolish . . . so naïve.

It was not everybody that you could talk to about it. Even now it is not an easy subject. In regular conversations you mention it, but not very often.

Another element conspiring against the interaction hypothesis that emerged from the focus group discussions was the isolation of some women, especially housewives busy with domestic chores who stay at home for most of the time and have no social life.

I did not talk about it because I did not mingle with friends. I used to work very hard, and did not have friends as I do now. It was not until recently that I knew about contraceptives, because I don't have many friends or go out very often.

To tell you the truth I never had any friends, not when I was single, nor when I got married.

The existence of these barriers to interaction diffusion (social isolation and secretiveness about family planning) suggest that the reduction of these barriers was a factor in the fertility transition. The mass media and the family planning programme probably helped in opening up the topic to public discussion. For example, several participants mentioned a message from a radio programme that said something like 'Don't be ashamed of talking about things that God was not ashamed of creating.' Socio-economic transformations, particularly female education and women's participation in the labour force, helped reduce the social isolation of women. Data from the 1992 fertility survey suggest that the probability of a woman meeting contraceptive users increases with education. Moreover, the data suggest an association between the extent to which a woman knows other people using contraceptives and her own contraceptive behaviour (Table 9.4).

Social interaction on reproductive matters took place during daily contact with relatives (sisters, in-laws, and female cousins), as well as with women co-workers and classmates. Parties and social events also provided an opportunity.

Table 9.4 Percentage distribution and contraceptive prevalence by the number of family planning users respondents know: women in a union, aged 15–49, Costa Rica, 1992 (%)

Variable	Known users				
	Total	None	1	2	3+
Age					
15–24	100	22	10	14	55
25–34	100	21	9	13	58
35+	100	32	11	15	42
Years of education					
< 6 elementary	100	35	11	16	38
Completed elementary	100	27	11	15	48
Secondary or more	100	20	9	12	59
Total	100	25	10	14	51
Contraceptive prevalence					
All methods	75	68	73	80	77
Modern methods	64	54	61	70	68

Source: CCSS (1992).

When we had parties, the men drank and the women got together to talk about how to avoid pregnancies. We used to talk about how to make children and how to avoid pregnancies, those were our favourite subjects.

I had friends because my husband is a friendly person, he used to get together with his workmates and they would bring their wives and there we talked about birth control. There was communication. We usually talked about the pill, sometimes about the IUD or condoms. Those were the most used.

Interactions on reproductive matters did not happen in a casual way with strangers. Nobody in the focus groups described such exchanges as happening, say, in a bus or at the market. The exception was at the waiting-room in the health centre (*unidad sanitaria*). Several participants recollected situations in which they learnt about family planning methods from other women in the *unidad*.

It was during the pre-natal visits that we heard about the different methods, some women would use the pills, others condoms, you would not hear much about the IUD.

I heard about family planning for the first time when I brought my sick daughter to the clinic. I started to listen to the other women. They would say, 'Did you hear from Carmen that they are going to offer family planning here, that they are going to bring pills?' Once I heard a woman saying that she used condoms and got pregnant. She did not know what had happened inside, or if the condom was torn, the thing was that she got pregnant.

Conclusion

Fertility transition theories often implicitly assume isolated individuals: people weighing privately costs and the benefits of children and the objective and subjective costs of birth control in order to make reproductive decisions. The adherence to routine behaviours dictated by cultural norms is also sometimes acknowledged. From this standpoint, the fertility of a population is a simple aggregation of individual motivations and cost constraints. We argue here that reproductive behaviour is also influenced by social contagion. Our hypothesis is that the adoption of birth control by some individuals affects the probability of adoption by others. The implication is that the reproductive behaviour of, say, an illiterate wife of a farmer will be different if those with whom she interacts are practising birth control than if they are not.

Theories of social interaction are not new in the social sciences (see Tarde 1890). That the practice of birth control 'diffuses' from an elite to the masses has been noted, even in the earliest literature on fertility decline. Studies of contemporary and historical fertility transitions have increasingly invoked the notion of diffusion to explain puzzling features of the spatial-temporal patterns of fertility change. Our objective was to add rigour to the debate by focusing on the concept of social interaction diffusion and presenting quantitative and qualitative evidence for diffusion effects during the course of the Costa Rican fertility transition.

The Costa Rican transition exhibits many features suggestive of diffusion dynamics: the decline occurred extremely rapidly, outpacing socio-economic development and reaching all major strata in a relatively brief period of time; there is no evidence of a downward shift in family size preferences that corresponds, either in timing or in magnitude, with the fertility decline; and the spatial-temporal pattern of fertility decline shows a spatial ordering suggestive of contagion between neighbouring areas. Macro-level evidence from econometric models supports the hypothesis of ideational contagion in the adoption of birth control, especially during the early stages of the fertility transition.

The qualitative evidence from the focus group discussions supports the notion that interaction diffusion exists, and that it is a plausible determinant of the adoption of birth control. Women actually talked to each other on reproductive matters, and exchanged information about family planning. More importantly, they gave and received advice and support that facilitated and motivated the use of contraceptives. These interactions were generally with female relatives and friends.

The qualitative evidence also shows that the taboo surrounding reproductive matters and the social isolation of some women can inhibit interaction diffusion effects on fertility. The reduction of these barriers probably contributed to fertility decline. As noted above, an increase in the interaction rate is necessary for diffusion to operate. Mass media and the family planning

programme helped open up the topic for public discussion. Increases in female education and labour force participation reduced the social isolation of women and helped expand the interaction rate. The qualitative data also suggest that important value changes might have contributed to the fertility transition in Costa Rica, notably changes in gender relations, in openness on sex matters, in religious adherence, and in the importance attached to health.

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