

Appendixes

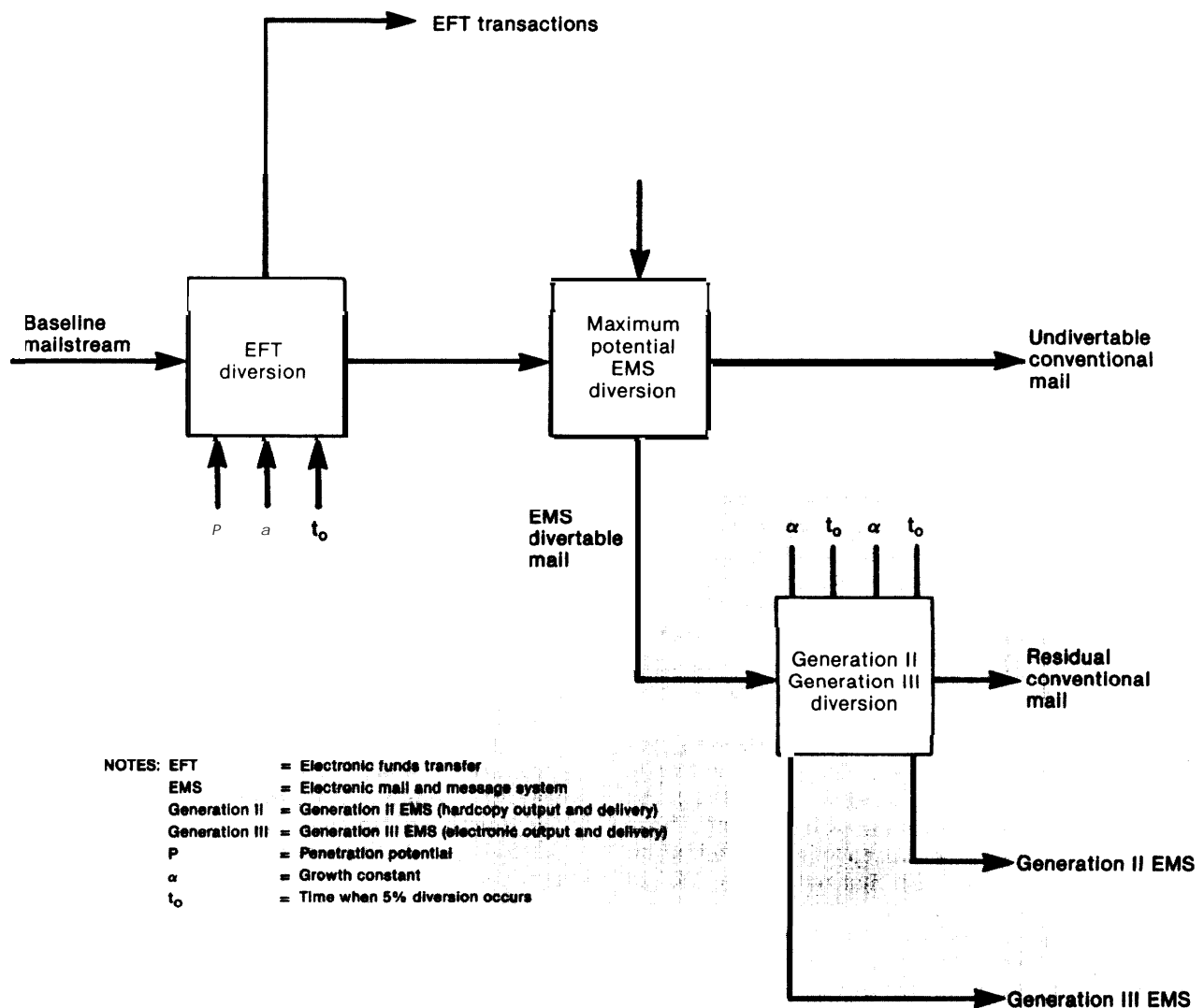
Supplemental Detail on the Market Penetration Model

Narrative Discussion

Appendix A includes the following. Figure A-1 shows the structure of the model with the diversion parameters (P , α , t_0) indicated for electronic

funds transfer (EFT) and Generations II and III electronic mail and message service (EMS). Table A-1 provides complete detail on the baseline mailstream.

Figure A-1.—Structure of Market Penetration Model



SOURCE Office of Technology Assessment.

Table A-1 —Baseline Mainstream, 1977, Billions of Pieces

| Mail content/class | To households | | | | | | To nonhouseholds | | | | | |
|---------------------------------------|---------------|--------|-------|--------|-------|--------|-------------------|--------|-------|--------|-------|--------|
| | First | Second | Third | Fourth | Other | Totals | First | Second | Third | Fourth | Other | Totals |
| From households | | | | | | | | | | | | |
| Correspondence | 6.6 | ..... | ..... | ..... | 0.2 | 6.8 | 1.4 | ..... | ..... | ..... | (a) | 1.4 |
| Negotiable instruments | 0.1 | ..... | ..... | ..... | ..... | 0.1 | 6.5 | ..... | ..... | ..... | ..... | 6.5 |
| Merchandise | (a) | ..... | (a) | 0.1 | ..... | 0.1 | — | (a) | (a) | (a) | ..... | 0.1 |
| Miscellaneous | 0.1 | ..... | ..... | ..... | ..... | 0.1 | 1.2 | ..... | ..... | ..... | ..... | 1.2 |
| Totals | 6.8 | ..... | (a) | 0.1 | 0.2 | 7.1 | 9.1 | (a) | (a) | (a) | (a) | 9.2 |
| From nonhouseholds | | | | | | | | | | | | |
| Correspondence | 1.5 | — | 0.1 | (a) | 0.1 | 1.7 | 5.2 | — | 0.5 | — | ..... | 5.7 |
| Negotiable instruments | 1.8 | — | (a) | — | (a) | 1.9 | 1.5 | ..... | ..... | ..... | ..... | 1.5 |
| Merchandise | 0.2 | (a) | 0.5 | 0.3 | 0.1 | 1.2 | — | — | 0.7 | 0.1 | ..... | 0.8 |
| Bills | 8.8 | — | 0.1 | — | (a) | 8.9 | 8.4 | — | 0.1 | — | ..... | 8.5 |
| Financial statements | 2.6 | — | (a) | — | (a) | 2.6 | Included in bills | | | | | |
| Legal/financial instruments | — | — | — | — | — | — | 1.9 | — | — | — | ..... | 1.9 |
| Other nonadvertising | 6.0 | 8.3 | 9.5 | 0.1 | 0.1 | 24.0 | — | 0.9 | 2.3 | ..... | ..... | 3.2 |
| Advertising | 1.1 | 0.1 | 7.2 | 0.1 | (a) | 8.5 | 2.3 | — | 3.0 | — | ..... | 5.3 |
| Miscellaneous | 0.5 | — | 0.4 | — | — | 0.9 | — | — | — | — | ..... | — |
| Totals | 22.5 | 8.4 | 17.9 | 0.5 | 0.4 | 49.7 | 19.3 | 0.9 | 6.6 | 0.1 | 0.3 | 27.3 |

^aBetween 0.01 and 0.05 billion pieces.

SOURCES: Office of Technology Assessment; and M. Kallick, W. Rodgers, et al., *Household Mailstream Study, Final Report*, prepared for the Mail Classification Division, USPS, 1978. Also, *Nonhousehold Mailstream Study, Interim Report for First Postal Quarter PFY 1979*, July 1979. First-class mail includes penalty and franked mail.

The major mail segments in table A-1 were regrouped to combine some of the smallest categories, and to further divide some of the larger categories. For example, household/household correspondence was separated into letters and greeting cards, since the potential for electronic handling of letters maybe significantly greater than that of greeting cards. Also, nonhousehold/non-household correspondence was separated into intracompany and intercompany categories, since the potential for electronic handling of intracompany mail maybe developing significantly faster than for intercompany mail. The miscellaneous categories, merchandise, and segments with a volume of less than 1 billion pieces per year were combined into one expanded miscellaneous category for each class of mail.

The mainstream segments resulting from this regrouping are listed in table A-2, along with the mail class (first, second, third, fourth, other) and 1977 baseline mail volume for each segment. Those segments judged to be susceptible to penetration by EFT and/or EMS are marked by an "X" in table A-2.

Table A-3 provides further detail on the EFT diversion parameters (P , α , t_0) for each mainstream segment judged to be susceptible to EFT.

Table A-4 provides complete detail on the Generation II and Generation III EMS diversion parameters. In order to simplify the analysis, the 26 mainstream segments listed in table A-2 were consolidated into 12 segments shown in table A-4. For the purposes of table A-4, the analysis focused on the type of mail content and sender/receiver pairs, rather than on different classes of mail. The parameters that determine the growth and timing of the projected Generation II logistic substitution curve for each mailstream segment are summarized in the upper half of the cells in table A-4. For each mainstream segment (column), the values α and t_0 for Generation II are listed in the row opposite the technology that controls growth and timing for that segment. For example, for Generation II household-household (H-H) greeting cards, $\alpha = 0.2$ and $t_0 = 1995$ is projected, based on the estimated availability of cost effective advanced electronic printers. The parameters that determine the growth and timing of the projected Generation III logistic substitution curve for each mainstream segment are shown in the lower half of the cells in table A-4. Again, the values are shown in the row opposite the controlling technological development.

Table A-2.—Mailstream Segments

| Mainstream segment | Mail class | 1977 volume ^a | Penetration by: | |
|--|------------|--------------------------|-----------------|-----|
| | | | EFT | EMS |
| H-H letters | 1 | 3.4 | — | X |
| H-H greeting cards | 1 | 3.2 | — | X |
| H-NH correspondence | 1 | 1.4 | — | X |
| NH-H bills | 1 | 8.8 | X | X |
| NH-H financial statements | 1 | 2.6 | X | X |
| NH-H other nonadvertising | 1 | 6.0 | — | X |
| NH-H other nonadvertising | 2 | 8.3 | — | X |
| NH-H other nonadvertising | 3 | 9.5 | — | X |
| NH-H correspondence | 1 | 1.5 | — | X |
| NH-H advertising | 1 | 1.1 | — | X |
| NH-H advertising | 3 | 7.2 | — | X |
| NH-N H advertising | 1 | 2.3 | — | X |
| NH-N H advertising | 3 | 3.0 | — | X |
| NH-NH intracompany correspondence | 1 | 3.2 | — | X |
| NH-N H intercompany correspondence | 1 | 2.0 | — | X |
| NH-NH other nonadvertising | 3 | 2.3 | — | X |
| NH-NH bills and statements | 1 | 8.4 | X | X |
| H-NH negotiable instruments | 1 | 6.5 | X | |
| NH-H negotiable instruments | 1 | 1.8 | X | |
| NH-NH negotiable instruments | 1 | 1.5 | X | |
| NH-N H legal/financial instruments | 1 | 1.9 | | |
| Miscellaneous | 1 | 2.1 | | |
| Miscellaneous | 2 | 1.0 | | |
| Miscellaneous | 3 | 2.5 | | |
| Miscellaneous | 4 | 0.7 | | |
| Miscellaneous | 0 | 0.9 | | |

^abillions of pieces of mail

H = Household

NH = Nonhousehold

1 = First-class

2 = Second-class

3 = Third-class

4 = Fourth-class

o = Other class

SOURCE: Office of Technology Assessment

Table A-3.—EFT Mail Diversion Parameters

| Mainstream segment | 1977 volume (billions) | Penetration potential (P) | Growth constant (a) | Time when 5 percent diversion occurs t. |
|--|------------------------|---------------------------|---------------------|---|
| NH-H bills | 8.9 | 0.9 | 0.20 | 1985 |
| NH-H financial statements | 2.6 | 0.9 | 0.20 | 1985 |
| NH-NH bills, statements, etc. | 8.4 | 0.9 | 0.20 | 1985 |
| H-N H negotiable instruments | 6.5 | 1.0 | 0.20 | 1985 |
| NH-H negotiable instruments | 1.9 | 1.0 | 0.20 | 1985 |
| NH-NH negotiable instruments | 1.5 | 1.0 | 0.20 | 1985 |

SOURCE: Office of Technology Assessment; see OTA, *Selected Electronic Funds Transfer Issues: Security, Privacy, and Equity*, OTA-BP-CIT-12, March 1982, for further discussion of EFT trends and developments which are generally consistent with the EFT diversion parameters.

Table A-4.—EMS Technology Assumptions and Diversion Parameters by Mail Content and Sender/Receiver Pair

| From-to | N-N Intra | N-N Inter | N-N | N-N | N-N | N-H | H-H | H-H | H-N | "NH | N-H | N-H |
|---------------------------------|-----------|-------------|-----------------------|-------------|-------------|-------------|-------------|-------------|-------------|----------|-----------------------|----------------------|
| Content | Corr | Corr | Other non-advertising | Bills | Advertising | Advertising | Cards | Corr | Corr | Corr | Other non-advertising | Bills and statements |
| Penetration Generation II | 100% | 100 %/0 | 70 %/0 | 100% | 100 %/0 | 100 %/0 | 100 %/0 | 100 %/0 | 100% | 100 %/0 | 70 %/0 | 100 %/0 |
| Generation III | 100 %/0 | 100 %/0 | 70 %/0 | 100% | 100 %/0 | 30% | 300/o | 100 %/0 | 100% | 100 %/0 | 70 %/0 | 100 %/0 |
| Early electronic printers II | | 30% 1983 | 30 %/0 1983 | 300/o 1983 | | | | | | 30% 1983 | 30% 1983 | 30 %/0 1983 |
| III | | | | | | | | | | | | |
| Advanced electronic printers II | | | | | 20 %/0 1995 | 20 %/0 1995 | 20 %/0 1995 | | | | | |
| III | | | | | | | | | | | | |
| EDP and office automation II | | | | | | | | | | | | |
| III | 30% 1983 | 20 %/0 1984 | 20 %/0 1984 | 20 %/0 1985 | 20 %/0 1987 | | | | | | | |
| Home computer terminals II | | | | | | | | 30% 1987 | 30% 1987 | | | |
| III | | | | | | | | 20 %/0 1987 | 41 %/0 1987 | 40% 1987 | 40 %/0 1987 | |
| Viewdata/teletext II | | | | | | | | | | | | |
| III | | | | | | 40 % 1985 | 20 %/0 1985 | | | | | |
| Inexpensive HC receiver II | | | | | | | | | | | | |
| III | | | | | | | | | | | | 20 %/0 1990 |

N = Nonhousehold

H = Household

(r = Initial rate of growth

t₀ = Year of 5% diversion

Key to Entries: Generation II EMS

Generation III EMS

| | |
|---|----------------|
| a | t ₀ |
| | |

SOURCE: Office of Technology Assessment.

Table A-5 shows the actual procedure used by the computer program to obtain the overall diversion results. The computer program applied an underlying growth rate to each mainstream segment, and then calculated the portion of each segment diverted to EFT, Generation II EMS, and Generation III EMS. These diversion estimates were calculated using the logistic growth curve (described in app. B) for each mainstream segment, with the parameters P (penetration potential), α (growth constant) and t_0 (time of 5-percent penetration), as specified earlier in tables A-3, A-4, and A-5. The diversion estimates for each mainstream segment were then added together to give overall estimates for residual conventional mail volume and for the volumes of mail diverted to EFT, Generation II EMS, and Generation III EMS.

Diversion estimates were calculated for the years 1985, 1990, 1995, and 2000. As explained in chapter 3, the results of the computer runs were adjusted upward by 10 percent (multiplied by a factor of 1.10) to compensate for the difference between the projected and actual growth rate in the mainstream for the years 1977-81.

Table A-5.—Procedure Used by Computer Program for Market Penetration Projections

1. Select the year, t , for which diversion estimates are to be calculated.
2. Compute a "UG" factor for the underlying growth in the mainstream relative to 1977. For most runs the assumption was 2 percent compounded growth. Hence the "UG" factor is 1.02 raised to the power $(t-1977)$.
3. Compute EFT penetration for each of the segments in table A-2 which are penetrated by EFT. First compute the penetration fraction f using the logistic substitution formula in appendix B, and the values of α and t_0 from table A-3. Then multiply the 1977 volume x the "UG" factor x the penetration potential P (from table A-3) $x f$. This yields the volume diverted to EFT in year t for each mainstream segment.
4. Reduce the 1977 volumes for segments affected by EFT by the amount of EFT diversion before computing EMS diversion.
5. Compute diversion to Generation III EMS for each mainstream segment affected by EMS just as in step 3 above for EFT, except use the reduced 1977 volumes for EFT impacted segments, and use α , t_0 , and P for Generation III from table A-4. The penetration potential P is contained in the third row of table A-4 (marked "PENETRATION"). The α and t_0 values for Generation III are in the lower half of the cells in table A-4.
6. Compute diversion to Generation II EMS for each segment in the same manner as in step 5 above, using α and t_0 from the upper half of each cell in table A-4. Then reduce the computed Generation II volume by the computed Generation III volume. If the Generation III volume exceeds the Generation II volume, then Generation II volume is zero.
7. Add results across mainstream segments for each class of mail to get diversion totals by class of mail.

SOURCE: Office of Technology Assessment