JAPANESE PUBLIC SUPPORT FOR OFFICIAL DEVELOPMENT ASSISTANCE

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Public opinion surveys conducted since 1977 in Japan are usually interpreted as showing decreasing support among the Japanese population for Official Development Assistance (ODA), and possibly, the Ministry of Foreign Affairs and the Cabinet Office of Japan have justified recent cuts in ODA funding levels on this basis. However, these interpretations have been based on the assumption that Japanese ODA funding levels have been static over time, which is manifestly incorrect. Here, we take proper account of the changing levels of ODA funding over time to demonstrate that changing survey response rates merely reflect changing ODA funding levels and that Japanese attitudes to ODA have been remarkably constant over the last few decades. We do this by reverse engineering survey results to derive the Japanese population's preference distribution for ODA funding levels over time.

I. INTRODUCTION

It is commonly claimed that public opinion surveys conducted since 1977 show decreased support among the Japanese population for Official Development Assistance (ODA), and possibly, such claims have been used to justify reductions in Japanese ODA levels in recent years. In fact, the 2002 White Paper on ODA issued by the Ministry of Foreign Affairs directly links these issues noting that "As a result of the prolonged economic slump and worsening of Japan's fiscal situation, the domestic view of ODA is growing harsh. The ODA budget has been decreasing since fiscal year 1998, and the ODA budget for fiscal year 2002 showed a particularly sharp decrease of 10.3% from the previous year." (Ministry of Foreign Affairs 2003). However, claims of decreased Japanese support for ODA have been based on the incorrect assumption that ODA funding levels have been constant over time. We show in this paper that significant increases in ODA funding over the last few decades has caused an educated and informed Japanese population to modify their survey responses over time. It is natural that increasing ODA levels will cause fewer people to want yet higher levels of ODA funding so increasing proportions of the population will become satisfied with current levels or will judge that increases have gone to far and will begin to call for decreased ODA levels. This paper provides a corrected analysis of the survey results by taking proper account of changing ODA levels, and then uses the known survey responses to historical ODA funding levels to reverse engineer approximate ODA preference distributions for the Japanese population. These preference distributions are time independent falsifying claims of decreasing levels of support, while their means and standard deviations suggest that a significant majority of the Japanese population would prefer ODA funding to be increased over current levels.

II. INTERPRETATIONS OF SURVEYS ON JAPANESE ATTITUDES TO ODA

Since 1977, public opinion surveys of Japanese attitudes to ODA have been conducted initially by the Prime Minister's Office and currently by the Cabinet Office of the Government of Japan. These surveys have asked the question (with minor changes over the years) whether Japan's ODA should be increased in scope, maintained at the current level, reduced as much as possible, or eliminated altogether, while also allowing a "don't know" response. Fig. 1 and Table I detail the survey responses

over time, which have shown a distinct downwards trend in the number of people wishing for increased levels of ODA funding, and an increasing number of people wishing to reduce or entirely eliminate ODA.

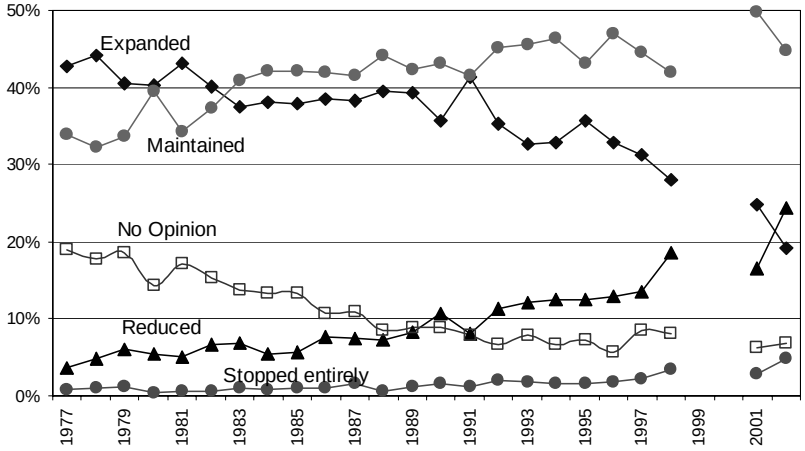

Figure 1: Survey results of Japanese attitudes to Official Development Assistance since 1977 with percentage responses that ODA should be (a) expanded, (b) maintained, (c) reduced, (d) stopped entirely, or (e) no opinion. See Table I. (Note that figures are not complete for all years.)

These trends, whenever they have been noted, have stimulated much negative comment about decreasing Japanese support for ODA. Newspaper reports, for example, entitled "Japanese public gives thumbs down to overseas assistance" begin "Casting doubt on the effectiveness of the nation's foreign aid policy, Japan's overseas economic assistance received its lowest public approval rating since the government began polling, a survey released over the weekend said." (Karasaki 2002). This same article ends by citing worried comments by officials from the Cabinet Office. Opinion editorials explaining four years of cuts in ODA budgets (a cumulative cut of over 20% by 2003) state "Cabinet Office polls on diplomacy provide interesting figures. From 1991 – when Japan became the world's largest donor – to 2000, the percentage of those who believed ODA should be increased dropped by nearly one-half, while the proportion of those who believed it should be reduced almost tripled. As a result, the difference between the two groups narrowed to near parity. The major reason for the diminishing public support for ODA is the deterioration of economic and fiscal conditions. Foreign Ministry scandals involving ODA projects have further 'alienated' the public." (Nabeshima 2003). Other commentators have concluded "Those who were negative about aid tripled in number between 1977 and 1996 but from a low base (4.5 per cent to 14.7 per cent) – still less than one-third of those who think the aid level is sufficient" (Randel and German 1998). Also, "The number 'actively in support of ODA' has been steadily declining" while "The number of people who believe ODA 'should be terminated' or 'should be reduced to a minimum level' has been gradually increasing […] In particular, the percentage of those who think that ODA 'should be reduced to a minimum level' has increased steadily during this period" (Uchida 1996). In similar vein, it was noted that "Until 1982, Japanese who advocated increased foreign aid outnumbered those who thought it should be reduced," though by 1989 these proportions had reversed so "those who felt aid should remain at its current level or be reduced numbered 52 per cent, well above the 39.5 per cent who supported its increase. This turn around has been gradual, and there is still a strong majority who feel that aid assists the developing countries, even if not all endorse increased spending." (Rix 1993). More neutral or even positive interpretations of the survey results appear when commentators do not make comparisons over time, see for instance (Orr Jr. 1990; Fukushima 2000).

TABLE I

JAPANESE ATTITUDES TO OFFICIAL DEVELOPMENT ASSISTANCE SINCE 1977

	(a) increased	(b) maintained	(c) reduced	(d) ceased	(e) don't know
1977	42.70%	33.80%	3.70%	0.80%	19.00%
1978	44.10%	32.30%	4.90%	1.10%	17.70%
1979	40.60%	33.70%	6.00%	1.20%	18.60%
1980	40.30%	39.50%	5.50%	0.40%	14.40%
1981	43.10%	34.20%	5.00%	0.70%	17.10%
1982	40.10%	37.20%	6.60%	0.70%	15.40%
1983	37.60%	40.90%	6.80%	1.00%	13.70%
1984	38.20%	42.20%	5.40%	0.80%	13.30%
1985	37.90%	42.10%	5.60%	1.00%	13.30%
1986	38.50%	42.00%	7.60%	1.10%	10.70%
1987	38.40%	41.60%	7.50%	1.60%	10.90%
1988	39.50%	44.20%	7.20%	0.70%	8.50%
1989	39.40%	42.40%	8.20%	1.20%	8.90%
1990	35.60%	43.20%	10.70%	1.60%	8.90%
1991	41.40%	41.50%	8.00%	1.30%	7.80%
1992	35.20%	45.10%	11.20%	2.00%	6.60%
1993	32.60%	45.60%	12.10%	1.80%	7.80%
1994	32.90%	46.30%	12.50%	1.60%	6.60%
1995	35.60%	43.10%	12.50%	1.60%	7.20%
1996	32.90%	46.90%	12.90%	1.80%	5.60%
1997	31.20%	44.50%	13.60%	2.30%	8.40%
1998	28.00%	42.00%	18.50%	3.50%	8.00%
1999					
2000					
2001	24.70%	49.80%	16.50%	2.80%	6.20%
2002	19.20%	44.80%	24.30%	4.80%	6.90%

Note: Responses to Japanese public opinion surveys conducted since 1977 with response categories (a) "Should be actively promoted," (b) "The present level is sufficient," (c) "Should be reduced as much as possible," (d) "Should be stopped,", or (e) "Don't know." Until the May 1980 poll, the wording for choice (b) was "Ordinary levels should be adequate,", while until the June 1982 poll, the wording for choice (c) was "It would be better to cut back as much as possible." See (Ministry of Foreign Affairs 1988-1999; Karasaki 2002). Note that data is incomplete in recent years due to the cessation of the Ministry of Foreign Affairs Annual Report series after 1999.

The Ministry of Foreign Affairs in its Annual Reports on ODA has commonly performed comparisons over time, noting in the year 2002 that "According to the opinion survey conducted by the Cabinet Office, about 70% of Japanese citizens responded either 'aggressively pursue' or 'maintain the present level' of Japan's ODA, showing an increase in the level of support for ODA as compared with the previous year's survey result." (Nishida 2002). This increase was in contrast to the results discussed in 1999 where it was stated that "Opinion surveys have indicated that public support for the nation's ODA policies and programs, though not as high as it used to be, remains relatively high. At the same time, the Japanese people are clearly doubting the continued need for massive amounts of ODA when corporate collapses and restructuring are spurring unemployment at home.", with the explanation for

decreased support offered in 1998 being "In Japan, a protracted economic slump and an intensifying atmosphere of fiscal crisis have imposed new constraints on the ODA budget." (Ministry of Foreign Affairs 1988-1999). On a number of occasions, the Ministry of Foreign Affairs has explained the declining support for ODA in Japan as being similar in origin to trends observed in the United States of America where "people's perceptions of ODA may rest on a considerable degree of misunderstandings. Because most ODA activities are carried out overseas, inevitably it is difficult for people to feel concerned about it or to understand well what it means to recipients. This problem is not peculiar to the United States, but common to all aid donor nations, including Japan. It is necessary to bear firmly in mind this very reason the government's responsibility to fully inform its people." (Ministry of Foreign Affairs 1988-1999). Similar views were expressed in the Final Report of the Council on ODA Reforms for the 21st Century which noted "ODA has not been considered much of an issue inside Japan largely because the projects themselves are carried out abroad and therefore remain relatively inconspicuous. … In addition, though, to win broader public understanding and support, the country also needs to step up its efforts in disclosure and publicity." (Ministry of Foreign Affairs January 1998). The assumption that the Japanese public do not understand and strongly support ODA imply that "If ODA is to have the broad support and understanding of the Japanese public in the years ahead, it is vital that each and every citizen be more actively involved as a participant. … This, however, will demand that steps be taken to heighten the public's understanding and readiness to cooperate." (Ministry of Foreign Affairs January 1998). Finally, and as previously noted, the 2002 White Paper on ODA issued by the Ministry of Foreign Affairs worried that "As a result of the prolonged economic slump and worsening of Japan's fiscal situation, the domestic view of ODA is growing harsh." (Ministry of Foreign Affairs 2003).

In general, it is now almost taken for granted that survey results show consistently declining levels of support for ODA in Japan. This is worrying as these surveys are conducted with the specific intention of informing government policy. As noted on the home page of the Cabinet Office of the Government of Japan, these polls are conducted to "help the government grasp clearly the trends in public opinion" with the results being "actually reflected in government policies" and serving "as a base for the national administration" and "as a reference for policy development" (Cabinet Office 2003). It is therefore very important that the analysis of survey results be correct. However, present interpretations are incorrect and should not be influencing policy decisions on ODA funding levels.

III. TAKING ACCOUNT OF HISTORICALLY CHANGING ODA FUNDING LEVELS

Great care must be taken when comparing the results of surveys conducted at different times to ensure that the various independent variables in each survey are well enough controlled to allow meaningful comparisons. See for instance, the design criteria of panel surveys sampling the same individuals at different times to assess changing attitudes (Warwick and Lininger 1975; Backstrom and Hursh-Cesar 1981). For examples of trend analyses with a particular focus on Japan, see (Kojima 1977; Sasaki and Suzuki 2000; Synodinos and Yamada 2000; Makita and Ida 2001). We note in passing that the Ministry of Foreign Affairs and other commentators have sometimes attempted to compare Japanese attitudes to ODA with those held in other countries, though the difficulties in making such comparisons mirror the difficulties of comparing surveys conducted at different times (Rokkan, Verba et al. 1969). For an interesting discussions of these points, see (Sasaki and Suzuki 2000).

A survey conducted at time t seeks to query a population (A_t) holding some distribution of preferences (P_t) while occupying an environment (E_t) by forming a sample (S_t) who are asked questions (Q_t) and provide responses (R_t). It is then assumed that any changes in the observed responses R_t reflects changes in some or all of the independent input variables – a safe assumption – but meaningful analysis requires knowing which input variables have changed. For instance, economists use sequential polls to gauge the state of the economic cycle (E_t) by always addressing the same questions to identical random samples of the same population holding an unchanging utility or preference

distribution (A_t, P_t, S_t, and Q_t are constant within sampling errors), so changes in responses ($R_t \rightarrow R_{t'}$) accurately reflect changes in the economic cycle ($E_t \rightarrow E_{t'}$). In contrast, political polls ask fixed questions about voting intentions of identical random samples of the same population (A_t, S_t, and Q_t are constant within sampling errors), so changes in responses ($R_t \rightarrow R_{t'}$) accurately reflect changes in either the populations preference distribution for one party or policy over another ($P_t \rightarrow P_{t'}$) or changes in the political environment due to for instance leadership changes ($E_t \rightarrow E_{t'}$). Polls do not need to disaggregate these last two categories as each of them influences voting intentions.

With respect to the surveys of Japanese attitudes towards ODA, it has been commonly assumed that largely unchanging questions have been addressed to identical random samples of the same population occupying a constant environment (A_t, S_t, Q_t and E_t are constant within sampling errors), so changing survey responses ($R_t \rightarrow R_{t'}$) reflect changes in the ODA preference distribution of Japanese population ($P_t \rightarrow P_{t'}$). No evidence has ever been provided for why such a massive change in population preferences might be occurring, and indeed, there is considerable evidence that the ODA environment has been changing over time ($E_t \rightarrow E_{t'}$) invalidating the assumption of a constant environment. Because of this, we here consider the far more reasonable possibility that the surveys of Japanese attitudes towards ODA have addressed unchanging questions to identical random samples of the same population holding an unchanging preference distribution (A_t, S_t, Q_t and P_t are constant within sampling errors), so changing survey responses ($R_t \rightarrow R_{t'}$) reflect changes in the ODA funding environment ($E_t \rightarrow E_{t'}$) over time. Here, a constant preference distribution held in a changing environment leads to changing survey responses. We will confirm this hypothesis by reverse engineering the known changes in historical funding levels and survey responses to derive families of potential time-independent ODA preference distributions for the Japanese population. In turn, these constant preference distributions can be combined with the changing ODA funding levels to consistently predict observed survey responses.

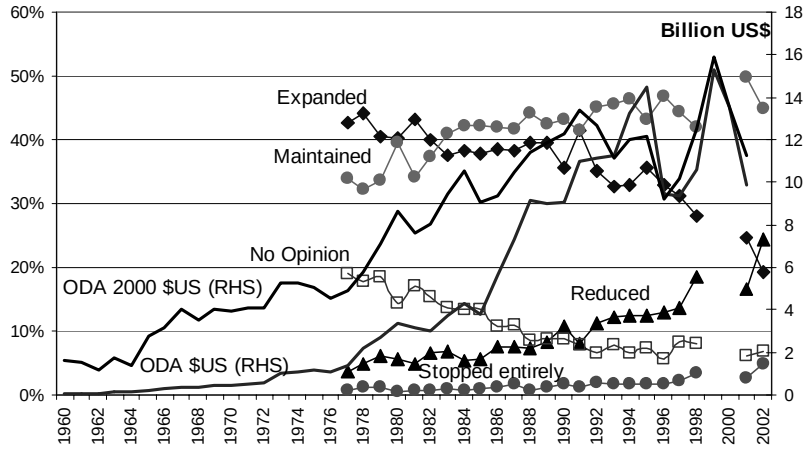

Figure 2: Survey results of Japanese public opinion responses placed in perspective in relation to the magnitude of ODA expenditure in each year. We show Japanese ODA expenditures in Billions of current year and year 2000 (inflation adjusted) US$. See Table II.

To establish that the ODA funding environment has been changing over time ($E_t \rightarrow E_{t'}$), consider Figure 2 showing survey results together with the changing levels of ODA in both current year US$ and in inflation adjusted year 2000 US$ (OECD-DAC; Ministry of Foreign Affairs 1988-1999). Figure 3 shows ODA funding over the same period expressed in both current year Japanese ¥ and in inflation adjusted year 1995 ¥. Table II lists this ODA data. Figures 2 and 3 clearly show that from the 1960s, Japanese ODA was rapidly rising from initially low levels, and in particular, ODA levels when the surveys commenced were not high compared to later levels. When ODA levels are small, it is

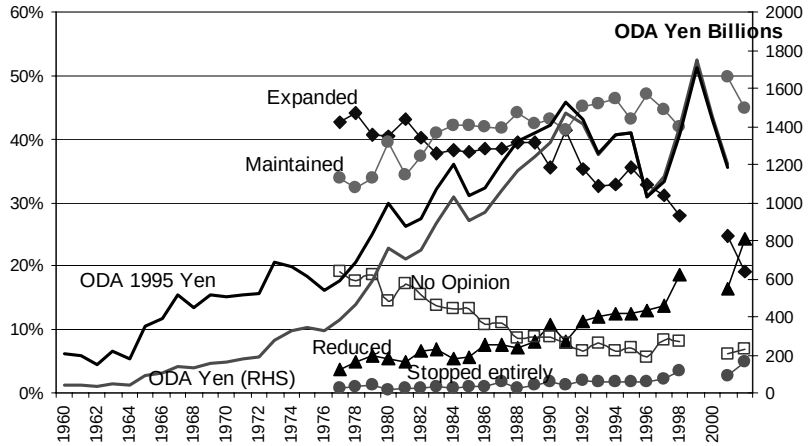

Figure 3: Survey results of Japanese public opinion responses placed in perspective in relation to the magnitude of ODA expenditure in each year. We show Japanese ODA expenditures in Billions of current year and 1995 (inflation adjusted) Yen. See Table II.

natural that a significant proportion of the population might want to increase ODA. Conversely, as ODA levels increase, it is natural that more and more people will be satisfied with current ODA levels and will cease to call for increases in ODA funding. These people will then call for either the maintenance of ODA levels or their decrease. Similarly, when ODA levels are low, there will be some proportion of the population satisfied with those levels and thus calling for maintained levels of ODA funding. Any subsequent increase in ODA funding levels would cause these people to modify their responses to call for a reduction in ODA funding.

A simple (and not overly realistic) model will briefly demonstrate this. (See Figure 4.) Denote the time-dependent level of ODA in year t as $O(t)$, and the proportion of the Japanese population that desires a level of ODA equal to x as $P(x)$, assumed to be unchanging in time and continuous. The variable x ranges from $x=0$ where some proportion of the population $P(0)$ desires ODA to be zero or "stopped entirely", up to infinity, $x=\infty$. Immediately then, the proportion of people wishing to expand ODA in year t is all those desiring $x>O(t)$, or

$$P_{+}(t) = \int_{O(t)}^{\infty} P(x)dx\,, \tag{1}$$

equal to the horizontally hatched area of Figure 4. Similarly, the proportion of the population wishing to decrease ODA in year t is all those desiring $x<O(t)$, or

$$P_{-}(t) = \int_{0}^{O(t)} P(x)dx\,, \tag{2}$$

equal to the vertically hatched area of Figure 4. Even when the population preference distribution is entirely time independent, the changing funding levels $O(t)$ cause changes in the proportions of the population wishing to increase ODA, $P_{+}(t)$, or decrease ODA, $P_{-}(t)$. Usually, increases in current levels of ODA, $O(t)$, will decrease $P_{+}(t)$ and increase $P_{-}(t)$. These movements are entirely consistent with the survey results.

TABLE II

JAPANESE OFFICIAL DEVELOPMENT ASSISTANCE SINCE 1960

	ODA/GNP	ODA US$ (Billion)	ODA Year 2000 US$ (Billion)	ODA ¥ (Billion)	ODA Year 1995 ¥ (Billion)
1960	0.24%	0.105	1.591	37.790	201.008
1961	0.20%	0.108	1.521	38.999	196.964
1962	0.14%	0.085	1.145	30.668	145.346
1963	0.20%	0.138	1.770	49.887	221.720
1964	0.14%	0.116	1.408	41.992	179.453
1965	0.27%	0.244	2.809	88.206	352.824
1966	0.28%	0.285	3.122	103.256	394.105
1967	0.32%	0.385	3.997	139.447	510.795
1968	0.25%	0.356	3.477	128.374	447.295
1969	0.26%	0.436	4.033	156.262	517.425
1970	0.23%	0.458	3.962	164.056	507.912
1971	0.23%	0.511	4.085	178.288	518.279
1972	0.21%	0.611	4.083	188.188	522.744
1973	0.25%	1.011	5.284	274.487	682.802
1974	0.25%	1.126	5.236	328.567	663.771
1975	0.23%	1.148	5.066	340.726	615.030
1976	0.20%	1.105	4.510	327.633	540.648
1977	0.21%	1.424	4.930	382.344	583.731
1978	0.23%	2.215	5.745	466.036	682.337
1979	0.27%	2.685	7.061	588.552	831.288
1980	0.32%	3.353	8.660	760.125	996.232
1981	0.28%	3.171	7.638	699.523	873.312
1982	0.28%	3.023	8.078	753.029	916.094
1983	0.32%	3.761	9.403	893.238	1065.916
1984	0.34%	4.319	10.508	1026.194	1197.426
1985	0.29%	3.797	9.060	905.964	1036.572
1986	0.29%	5.634	9.341	949.329	1078.783
1987	0.31%	7.342	10.456	1061.653	1205.055
1988	0.32%	9.134	11.446	1170.065	1319.127
1989	0.31%	8.965	11.870	1237.170	1364.024
1990	0.31%	9.069	12.300	1313.191	1404.483
1991	0.32%	10.952	13.400	1473.044	1526.470
1992	0.30%	11.151	12.638	1412.832	1438.729
1993	0.27%	11.259	11.132	1252.001	1259.558
1994	0.29%	13.239	12.019	1353.026	1351.674
1995	0.28%	14.489	12.156	1363.415	1363.415
1996	0.20%	9.439	9.232	1026.996	1025.970
1997	0.22%	9.358	10.142	1132.318	1111.205
1998	0.28%	10.640	12.482	1392.789	1358.819
1999		15.323	15.869	1745.319	1707.749
2000		13.508	13.508	1456.158	1434.639
2001		9.847	11.260	1196.389	1186.893

Note: See (OECD-DAC; Ministry of Foreign Affairs 1988-1999).

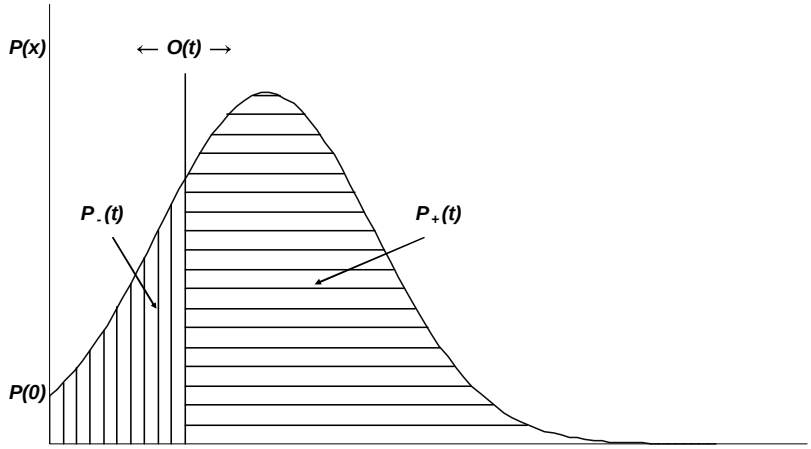

Figure 4: In year *t*, the proportion of the population *P(x)* desiring an ODA level of size *x*, together with the ODA level *O(t)* determines the proportion of people wishing to increase ODA funding $P_+(t)$ (horizontally hatched area) and the proportion of people wishing to decrease ODA funding $P_-(t)$ (vertically hatched area). Obviously, changes in ODA funding levels, *O(t)*, change these proportions even when population preferences are unchanging.

The only population category which will not change proportionately to changing ODA levels is that segment calling for ODA to be "stopped entirely" (assuming *P(x)* is time independent). This is the value *P(0)* in Figure 4. If changes in population responses reflected only changing ODA levels there should be no increase in the number of people calling for a cessation of ODA, so *P(0)* is constant. Conversely, if the population was becoming increasingly disillusioned with ODA, we would expect an increasing proportion of the population to call for the cessation of ODA, so *P(0)* would be increasing. Figures 1 – 3 and the data listed in Table I do not show a marked increase in the proportion calling for the cessation of ODA over most of the life of the survey. It was only in about 1997 that this segment of the population substantially increased in size, and this increase probably was not caused by changing ODA levels which by then were fluctuating but likely reflected public dissatisfaction caused by scandals in the Ministry of Foreign Affairs and Ministry of Finance, as well as ongoing recessions in the Japanese economy in the latter part of the 1990s. The relative constancy of the proportion of the population calling for the cessation of ODA, *P(0)*, strongly suggests that Japanese attitudes to ODA are not becoming more negative over time.

We note in passing that the decreased numbers of people expressing "No Opinion" suggests that ongoing development education and outreach policies are working well.

For completeness, we show in Figure 5 a comparison between survey results and ODA levels expressed as a percentage of Japanese Gross National Product (GNP). (Again, this data is presented in Table II.) Over the last four decades, this percentage (ODA/GNP) has not shown a marked trend suggesting that survey results are not strongly influenced by this ratio. In turn, this suggests that the Japanese population are not deciding their preferred ODA levels using ODA/GNP ratios, but probably by comparison of the absolute ODA spending levels of Japan and other countries.

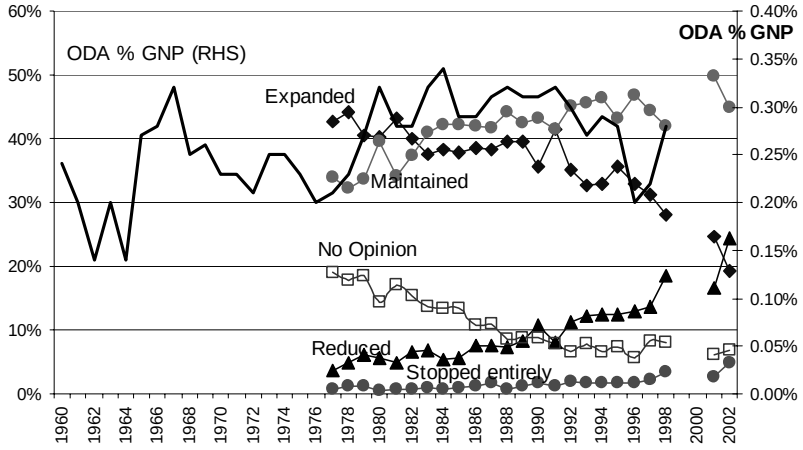

Figure 5: Survey results of Japanese public opinion responses placed in perspective in relation to ODA levels expressed as a percentage of Japanese GNP. See Table II.

IV. REVERSE ENGINEERING JAPANESE ODA PREFERENCE DISTRIBUTIONS

It is possible to reverse engineer the survey results to derive information about the ODA preferences of the Japanese population. Economists do something similar when they assume a constant population preference (or utility) function and then use survey results to try to deduce the current status of the business cycle – positive survey responses indicate a growing economy while negative responses show an economy in recession. As previously mentioned, we combine the changing survey responses to known funding level changes to derive the Japanese ODA preference distribution, and show that a time-independent distribution is fully consistent with all results.

In essence, calculating Japanese ODA preference distributions is a readily understandable process. Consider for instance, a trial distribution with the Japanese population preferring a mean ODA level of μ=¥*500* Billion (measured in inflation adjusted 1995¥) with a small standard deviation of σ=¥*100* Billion say. This would mean that any ODA funding levels above ¥1,000 Billion would be five standard deviations above the mean so 99.99% or more of the Japanese population would be either satisfied with ODA funding levels or calling for reductions. Obviously, this conflicts with survey results showing that a substantial proportion of the Japanese population desires increased ODA funding levels even when funding is above ¥*1,000* Billion. Similarly, survey results also contradict Japanese ODA preference distributions with a mean μ=¥*5,000* Billion with large standard deviations of σ=¥*1,000* Billion. Again, actual funding levels of even ¥2,000 Billion are three standard deviations below the mean so only a very small fraction of the population would be calling for maintained or reduced funding levels. In actuality, when ODA funding levels were about ¥*2,000* Billion, large proportions of the population desired maintained or reduced funding levels.

The actual calculations are not different in principle, though are more detailed and are provided in Appendix A. The derived families of possible ODA preference distributions have mean preferred ODA levels between $1555 < \mu < 1811$ (Billion 1995¥), and standard deviations varying from $825 < \sigma < 977$ (Billion 1995¥). These distributions are consistent with all historical survey results and ODA funding levels confirming our hypothesis that the Japanese ODA preference distributions are time independent.

V. CONCLUSION

In this paper we have demonstrated that the assumption of a constant funding environment underlying much commentary about Japanese ODA preferences is incorrect, and by taking account of

the changing funding environment we were able to derive families of Japanese ODA preference distributions which are time independent. These distributions have mean preferred ODA level lying in the range 1555 to 1811 (Billion 1995¥) and standard deviations in the range 825 to 977 (Billion 1995¥). This means 75% of the Japanese population prefer ODA levels above 1100 (Billion 1995¥), 50% prefer levels above 1700 (Billion 1995¥), and 25% prefer levels above 2300 (Billion 1995¥). (Refer ODA levels shown in Table II.) These levels are significantly higher than those existing at the present time suggesting that the present policies of cutting ODA funding do not represent the wishes of the Japanese people. At present as noted in the 2002 ODA White paper "The ODA budget has been decreasing since fiscal year 1998, and the ODA budget for fiscal year 2002 showed a particularly sharp decrease of 10.3% from the previous year." (Ministry of Foreign Affairs 2003). Our results suggest that a substantial ODA expansion is required to properly reflect Japanese preferences.

The changing responses of the Japanese people to changing funding levels suggests that in general, an educated and informed Japanese population is making rational assessments about their desired ODA funding levels while taking account each year of the amount of ODA expenditure. In turn, this suggests that the development education efforts conducted by the Japanese government are working well. We also conclude that the public opinion surveys are polling attitudes to current ODA funding levels rather than attitudes to the broad concept of ODA in general.

Finally, we note that it is possible that the recent scandals in the Ministry of Foreign Affairs and the Ministry of Finance and the series of Japanese recessions over the last decade will have changed the Japanese ODA preference distributions. It will be interesting to assess this possibility using future survey responses over the next decade.

APPENDIX A: REVERSE ENGINEERING JAPAN'S ODA PREFERENCE DISTRIBUTION

Here, we use survey results to reverse engineer possible ODA preference distributions of the Japanese population *P(x)* assumed to be time independent. The derived distributions are not unique, and the derivations are crude so results are indicative only. However, the results are robust as we demonstrate by using multiple methods to derive alternate distributions with similar statistics.

Suppose that the total time dependent ODA preference distribution of the Japanese population is

$$P_{tot}(x,t) = \overline{P}(x,t) + N(t), \tag{3}$$

where $N(t)$ is the proportion of the total population expressing "No Opinion" in year t and $\overline{P}(x,t)$ is the proportion of the total population preferring an ODA level of x in year t. Normalization requires that in any year the sum of all proportions must be unity so

$$\int \overline{P}(x,t)dx + N(t) = 1. \tag{4}$$

This allows the definition of a preference distribution for those people expressing an opinion in year t via the equality

$$\frac{1}{1-N(t)}\int \overline{P}(x,t)dx = 1, \tag{5}$$

where now, the relabelled distribution $P(x) = \overline{P}(x,t)/[1-N(t)]$, specifies the proportion of all those who actually expressed an opinion who prefer an ODA level of x. Then for example, if in some year $N(t)$ = 90% and 5% of all people prefer ODA levels above some value x_0, and 5% of all people prefer ODA levels below x_0, then the rescaled distribution $P(x)$ shows that 5%/(1-90%)=50% of those who

have expressed an opinion prefer levels above x_0 and 50% of those expressing an opinion prefer levels below this value. We hypothesis that the *P(x)* distribution is time independent, and test this hypothesis by deriving the observed survey results.

We now relate the survey results to this hypothesized time independent ODA preference distribution. Survey results can be modelled by designating the proportion of the population seeking to cease ODA in any given year as $\overline{P}_c(t)$, the proportion seeking to reduce ODA as $\overline{P}_-(t)$, those seeking to maintain ODA levels as $\overline{P}_m(t)$, those seeking to increase ODA as $\overline{P}_+(t)$, and those with no opinion as $N(t)$. Immediately, in any year *t* we have

$$\overline{P}_c(t) + \overline{P}_-(t) + \overline{P}_m(t) + \overline{P}_+(t) + N(t) = 1. \tag{6}$$

As previously, we must now take account of the time-dependent proportions of the population that express "No Opinion" or "Don't Know" in different years. The proportions of the total population can be converted to proportions of those people who actually expressed an opinion in any year by noting

$$\frac{\overline{P}_c(t) + \overline{P}_-(t) + \overline{P}_m(t) + \overline{P}_+(t)}{1 - N(t)} = 1, \tag{7}$$

so that a relabelling $P'_+(t) = \overline{P}_+(t)]/[1 - N(t)]$, etc, *g*ives

$$P'_c(t) + P'_-(t) + P'_m(t) + P'_+(t) = 1. \tag{8}$$

Again, this primed distribution is normalized to unit area.

As a further simplification, note that the (rescaled) category $P'_c(t)$ does not increase markedly over the period 1977 to 2002, and in fact, a line of best fit has slope 0.112%/year which is small compared to other categories (data presented below). This implies that this category can be taken to be a constant equal to the average P_c=1.72%. In actuality, the slowly increasing percentage wishing to cease ODA can be modelled using a distribution with either a constant mean and a slowly increasing standard deviation reflecting increased uncertainty in people's opinions, or by using a distribution with a slowly decreasing mean with a constant standard deviation, or by distributions intermediate between these two extremes. Because the variation is small and slow, we do not introduce large errors by approximating the proportion $P'_c(t)$ via the constant P_c. We can rescale all survey results by using the equality

$$\frac{P_c + P'_-(t) + P'_m(t) + P'_+(t)}{1 - P'_c(t) + P_c} = 1, \tag{9}$$

together with a relabelling $P_+(t) = P'_+(t)]/[1 - P'_c(t) + P_c]$, etc, to give

$$P_c(t) + P_-(t) + P_m(t) + P_+(t) = 1. \tag{10}$$

Again, this unprimed distribution is normalized with unit area, allowing a partitioning of the normalization condition $\int P(x)dx = 1$ into five regions to match the five categories of the surveys via

$$
\begin{aligned}
P_c(t) &= \int_{-\infty}^{0} P(x)dx \\
P_-(t) &= \int_{0}^{A(t)} P(x)dx \\
P_m(t) &= \int_{A(t)}^{B(t)} P(x)dx \\
P_+(t) &= \int_{B(t)}^{\infty} P(x)dx.
\end{aligned}
\tag{11}
$$

Here, the two moving boundaries *A(t)* and *B(t)* determined by the ODA levels in any year, denoted *O(t)*, together with the boundary at the origin, divide the distribution into five categories. The simplest assumption is that these boundaries move proportionally with changing ODA levels, so we set $A(t) = O(t) - \alpha$ and $B(t) = O(t) + \beta$ for constants α and β. We assume that when the ODA level is *O(t)*, all people with a preferred ODA level between $O(t) - \alpha$ and $O(t) + \beta$ for some constants α and β will respond as being satisfied and so fall into the category $P_m(t)$. Then everyone preferring ODA levels larger than $O(t) + \beta$ will fall into category $P_+(t)$, while all those preferring ODA levels between zero and $O(t) - \alpha$ will desire to reduce ODA levels and belong to the category $P_-(t)$. The remaining people have preferred ODA levels at zero (or below) and will respond that they wish to cease ODA. Testing our hypothesis of a time independent ODA preference distribution *P(x)* now merely requires that we be able to reproduce observed survey results using time dependent boundaries. If it proves to be impossible to reproduce observed survey results, then we would need to discard our hypothesis of a time independent Japanese ODA preference distribution.

GAUSSIAN OR NORMAL PREFERENCE DISTRIBUTION

To fit the observed survey data, we first consider using a Normal or Gaussian distribution as such distributions describe many economic variables. Thus, we model the Japanese ODA preference using the Gaussian distribution

$$
P(x) = \frac{1}{\sqrt{2\pi}\sigma} \exp\left[-\frac{1}{2}\left(\frac{x-\mu}{\sigma}\right)^2\right], \tag{12}
$$

with mean μ and standard deviation σ.

We can approximately fit a Gaussian distribution to survey results by using the following standard results: (a) 2.25% of the area under the distribution lies to the left of the point $\mu - 2\sigma$, (b) 13.75% lies between the points $\mu - 2\sigma$ and $\mu - \sigma$, (c) 34% lies between the points $\mu - \sigma$ and μ, and (d) 50% of the area lies to the right of the point μ. (The distribution is also perfectly symmetric about the point μ.)

The number of people wishing to cease ODA entirely, P_c, equates to that area lying to the left of the origin, and is equal to P_c =1.72%, which we approximate as $P_c = 2.25\%$. This means that the origin at $x = 0$ equates to the point $\mu - 2\sigma = 0$ giving the constraint $\sigma = \mu/2$. The proportion of people seeking to increase ODA is $P_+=52.33\%$ in 1977. If we approximate this as $P_+=50\%$, we immediately have $O(1977) + \beta = 845 + \beta = \mu$. The remaining two categories in 1977 have P_- equal to 4.53% and P_m equal to 41.42%. These values are approximately satisfied by setting $O(t) - \alpha = \mu - 3\sigma / 2$. This boundary lies midway between the points $\mu - 2\sigma$ and $\mu - \sigma$ and approximately satisfies the observed percentages for P_- and P_m. Noting $O(1977)=845$, this gives the constraint $\alpha = 845 - \mu/4$.

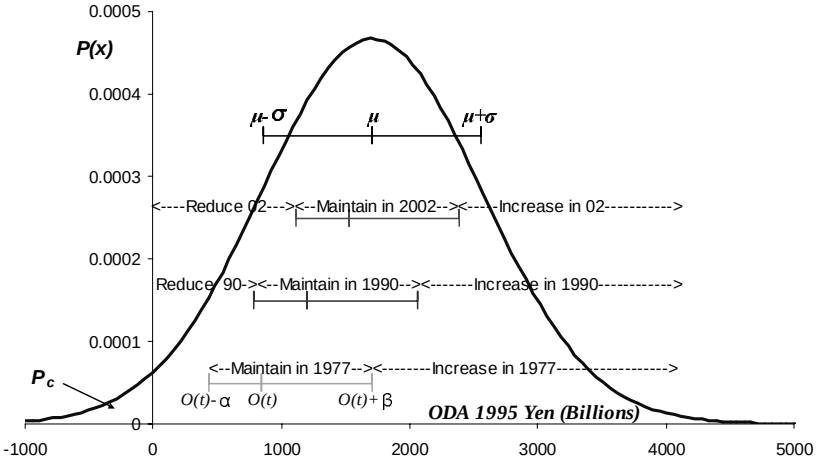

Figure 6: An approximate Gaussian or Normal ODA preference curve *P(x)* for the Japanese population over the period 1977 to 2002. Those people wishing to cease all ODA have preferred ODA levels less than zero and equate to the area P_c under the curve to the left of the origin. We indicate the proportions of the population which desire to reduce ODA, maintain ODA or increase ODA for three different years (1977, 1990, and 2002). This distribution has mean $\mu = 1708$ (Billion 1995¥) and standard deviation $\sigma = 854$ (Billion 1995¥).

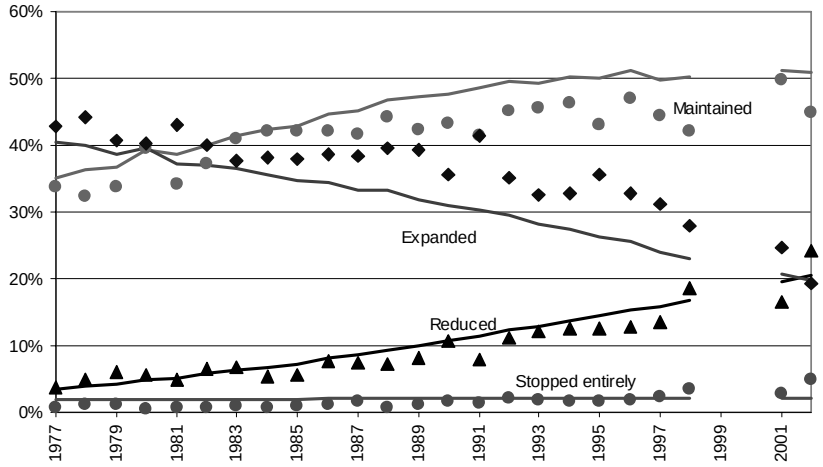

Figure 7: The approximate Gaussian preference curve *P(x)* shown in Figure 6 can be used to calculate model category responses allowing comparison with the actual survey data shown in Figure 1. Essentially, proportions of the population expressing an opinion in year *t* given by *P(x)* are rescaled to *[1-N(t)]P(x)* to give the category proportions of the total population wishing to cease, reduce, maintain, or increase ODA. The time dependent prefactor *[1-N(t)]* means that the predicted category levels fluctuate over time. It is evident that the model roughly reproduces survey responses over the period shown.

The proportion of people wishing to increase ODA has decreased in size by the year 2002 to $P_+ = 21.36\%$. A boundary satisfying this percentage lies between the points μ and $\mu + \sigma$ and is approximately located at $\mu + 0.8\,\sigma$. This specifies the constraint $O(2002) + \beta = 1528 + \beta = \mu + 0.8\,\sigma$,

so $\beta = \mu + 0.8\,\sigma - 1528$. Altogether, these constraints can be solved to give $\mu = 1708$, $\sigma = 854$, $\alpha = 418$, and $\beta = 863$ (Billion 1995¥). The derived distribution for Japanese ODA preferences is shown in Figure 6. Figure 7 compares the rescaled actual survey responses with those derived from the Japanese ODA preference distribution, and indicates this model does indeed roughly reproduce the observed data responses. We note that an improved Gaussian fit can be derived through the use of probability tables to more accurately fit data, and this generates results which are not significantly different from the approximate fit above.

LINEAR APPROXIMATION AND RECTANGULAR DISTRIBUTION

It is possible to calculate distributions which perfectly fit the trend data for all survey responses. We do this by using box-like or rectangular distributions. Lines of best fit to the rescaled data showing percentage responses of all those expressing an opinion are:

$$\begin{aligned} P_c &= 1.72(\%) \\ P_-(t) &= m_-t + b_- = 0.65(\%/yr)t - 1284.8(\%) \\ P_m(t) &= m_m t + b_m = 0.36(\%/yr)t - 674.51(\%) \\ P_+(t) &= m_+ t + b_+ = -1.02(\%/yr)t + 2066.44(\%). \end{aligned} \tag{13}$$

The linear approximation means that these lines no longer exactly sum to unity, but we approximately have $m_+ + m_m + m_- = 0$, and $b_+ + b_m + b_- + P_c = 1$. The line of best fit for changing ODA levels (in 1995 ¥ from 1977 onwards) is

$$O(t) = m_o t + b_o = 27.28(10^9¥/yr)t - 53095.76(10^9¥). \tag{14}$$

Note that a linearized model changes ODA levels and category proportions by a constant amount each year, which requires $P(x)$ to consist of multiple horizontal segments – only rectangular areas will reproduce the desired behaviour. A single segment cannot duplicate survey responses, so we consider $P(x)$ to consist of two segments, the first of height L between the origin and a point a, while the second has height R between the point a and a further point b. (See the final derived distribution in Figure 8.) We have

$$P(x) = \begin{cases} P_c & (if \quad x = 0) \\ L & (if \quad 0 < x \le a) \\ R & (if \quad a < x \le b) \\ 0 & (otherwise) \end{cases}. \tag{15}$$

The total area under the curve must be unity specifying the constraint

$$P(x) = P_c + La + R(b-a) = 1, \tag{16}$$

which determines the relation

$$b = \frac{1 - P_c - a(L-R)}{R}. \tag{17}$$

In order to achieve different growth rates in all of the categories, it is necessary that the boundary $O(t) - \alpha$ lies to the left of the point a, while the boundary $O(t) + \beta$ lies to the right of the point a, so $O(t) - \alpha < a < O(t) + \beta$ for all times from 1977 to 2002. As $O(t)$ is increasing in time, this specifies the constraint

$$O(2002) - \alpha < a < O(1977) + \beta. \tag{18}$$

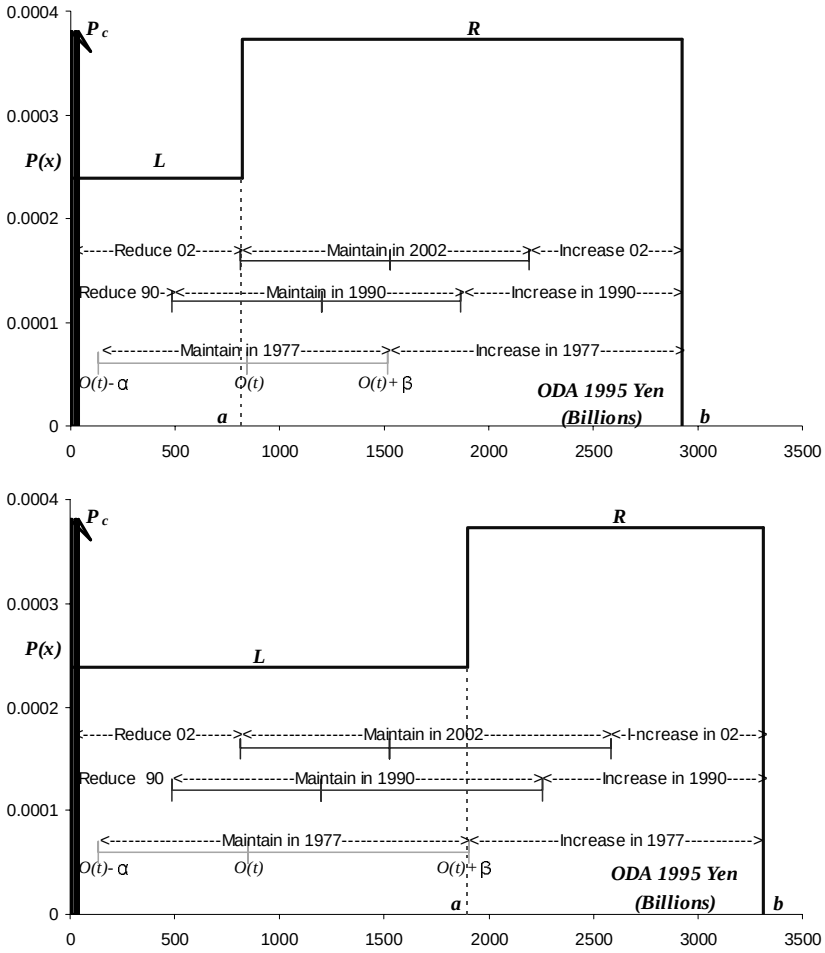

Figure 8: Families of preference distributions $P(x)$ of the Japanese population towards ODA over the period 1977 to 2002. Top, we set $a \rightarrow O(2002) - \alpha$, while bottom, we show the alternate limit $a \rightarrow O(1997) + \beta$; intermediate values also define permissible distributions. In each graph, we indicate the proportions of the population which desire to reduce ODA, maintain ODA or increase ODA for three different years (1977, 1990, and 2002). The mean and standard deviations of these distributions are not markedly different from those derived using the earlier Gaussian distribution.

The two graphs in Figure 8 show each of these respective limits. In each year, the ODA level $O(t)$ is changing, which also changes the areas $P_+(t)$, $P_m(t)$, and $P_-(t)$, and these changes can be calculated from the geometry of Figure 8. These changing proportions are also specified by the linearized survey results, so equating survey results and geometrical areas allows calculating all unknowns. For each respective category we have

$$
\begin{aligned}
P_{-}(t) &= m_{-}t + b_{-} = L[O(t) - \alpha] \\
P_{m}(t) &= m_{m}t + b_{m} = L[a - O(t) + \alpha] + R[O(t) + \beta - a] \\
P_{+}(t) &= m_{+}t + b_{+} = R[b - O(t) - \beta].
\end{aligned}
\tag{19}
$$

Solving these equations gives

$$
\begin{aligned}
L &= \frac{m_{-}}{m_{o}} \\
R &= \frac{-m_{+}}{m_{o}} \\
\alpha &= b_{o} - \frac{b_{-}}{L} \\
\beta &= b - b_{o} - \frac{b_{+}}{R}.
\end{aligned}
\tag{20}
$$

All quantities are then determined in terms of the constant *a* which can take any value in the constrained range noted above. In Figure 8, we show distributions for *a* at each limit of the permissible range. Each of the derived distributions in Figure 8 (and a host of intermediate distributions) are consistent with the linearized survey results. To interpret these graphs, note that the heavy arrow at ODA levels of zero indicate those people desiring to cease ODA entirely, or P_c. For ODA levels greater than zero, the preference distribution *P(x)* is indicated by the heavy line with left segment at height *L* and right segment at height *R*. The edges of these segments lie respectively at the points *a* and *b*. The shifting ODA levels over time, *O(t)*, and the shifting boundaries at $O(t) - \alpha$ and $O(t) + \beta$ defining the categories for reducing, maintaining and increasing ODA, are indicated by the embedded markers showing a shift to the right over time. It is clear that as these boundaries move to the right, the proportion of people seeking to increase ODA will rapidly decrease, those seeking to maintain ODA levels will be slowly increasing, and those seeking to reduce ODA will be increasing at slightly faster rate.

All of the derived preference distributions are heavily weighted to the right indicating that survey results can only be reproduced provided a significant proportion of the population desires quite high levels of ODA. In fact, the mean preferred value of ODA (μ) is

$$
\mu = \int_{0}^{\infty} xP(x)dx = La^{2}/2 + R(b^{2} - a^{2})/2, \tag{21}
$$

while the standard deviation (σ) is

$$
\sigma^{2} = \int_{0}^{\infty} x^{2}P(x)dx - \mu^{2} = La^{3}/3 + R(b^{3} - a^{3})/3 - \mu^{2}. \tag{22}
$$

As the parameter *a* varies between its two limits, approximately $820 < a < 1900$ (Billion 1995¥) as shown in Figure 8, the ODA mean varies from $1555 < \mu < 1811$ (Billion 1995¥), while the standard deviation varies from $825 < \sigma < 977$ (Billion 1995¥). These results ranges include the earlier statistics derived for the Gaussian distribution. All of the members of this family of distributions exactly reproduce the linearized trend data for survey responses as shown in Figure 9.

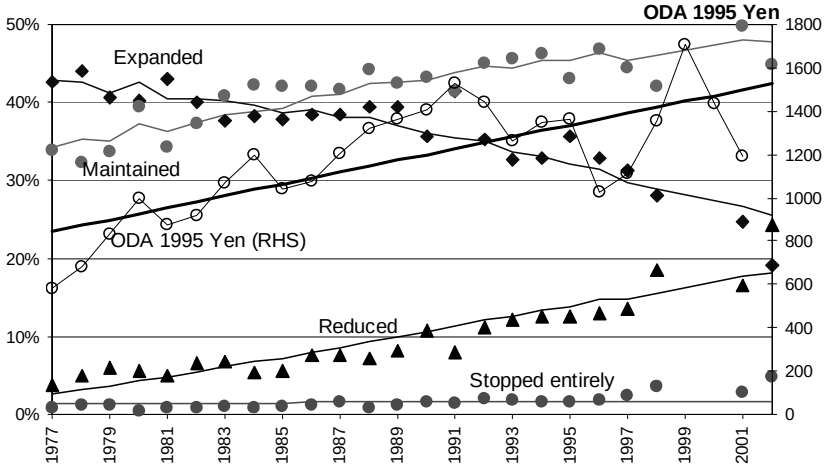

Figure 9: The rectangular preference curves *P(x)* shown in Figure 8 closely reproduce the observed survey responses shown in Figure 1. Essentially, proportions of the population expressing an opinion in year *t* given by *P(x)* are rescaled to *[1-N(t)]P(x)* to give the category proportions of the total population wishing to cease, reduce, maintain, or increase ODA. The time dependent prefactor *[1-N(t)]* means that the predicted category levels fluctuate over time.

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