

For  $p_x \geq 2V - \tau$ , to make firm  $y$  has no incentive to choose  $y = 0$ , firm  $x$  has to choose a price such that

$$3 \frac{V - p_x}{\tau} p_x = \frac{V^2}{2\tau}.$$

This gives the constrained  $p_x$ :

$$p_x = \frac{3 - \sqrt{3}}{6} V.$$

Note that  $\left. \frac{\partial(3 \frac{V - p_x}{\tau} p_x)}{\partial p_x} \right|_{p_x = \frac{3 - \sqrt{3}}{6} V} > 0$  and firm  $y$  has no incentive to undercut at this price.

$$\frac{3 - \sqrt{3}}{6} V \geq 2V - \tau$$

if

$$V \leq \frac{6}{9 + \sqrt{3}} \tau \approx 0.56\tau.$$

Therefore, for  $V \leq \frac{6}{9 + \sqrt{3}} \tau \approx 0.56\tau$ , the local optimal  $p_x = \frac{3 - \sqrt{3}}{6} V$ . For  $\frac{6}{9 + \sqrt{3}} \tau \approx 0.56\tau \leq V \leq \frac{2}{3}\tau$ , the price necessary for firm  $y$  not to have the incentive to locate at  $y = 0$  is less than  $2V - \tau$ . Therefore, the equilibrium falls into the second part of firm  $y$ 's best response with  $\underline{t}_y = \bar{t}_x$ . The equilibrium price is  $p_x = \frac{V + \tau - \sqrt{2(8V^2 - 9V\tau + 3\tau^2)}}{5}$ . Note that for  $\frac{6}{9 + \sqrt{3}} \tau \approx 0.56\tau \leq V \leq \frac{2}{3}\tau$ ,  $\frac{V + \tau - \sqrt{2(8V^2 - 9V\tau + 3\tau^2)}}{5} \leq 2V - \tau$ . ■

**Proof.** of Lemma 4

We proceed according to  $y$ 's global best response. The analysis here focuses on  $y$ 's best response for  $p_x \geq 6V - 10\tau - x\tau$ . For  $p_x < 6V - 10\tau - x\tau$ , the solution is always a corner solution with  $p_x^* \geq 6V - 10\tau - x\tau$ .

**Case (A)**  $p_x \leq \frac{16V - 11x\tau}{11}$

For this case,  $\bar{t}_y \geq \underline{t}_x$ . This gives firm  $x$ 's profit maximisation problem

$$\max_{p_x} \pi_x = (1 - t_{xy}) p_x = \left(1 - \frac{\tau x + p_x - p_y}{2\tau}\right) p_x.$$

Substitute in the condition that  $\bar{t}_x = 1$  into firm  $y$ 's best response gives

$$p_y = \frac{4V + \tau x + p_x}{10} = \frac{(3V + \tau + 2p_x)}{10}.$$

The maximisation problem is then

$$\max_{p_x} \pi_x = \frac{(13V + 11\tau - 18p_x) p_x}{20\tau}.$$

The FOC gives

$$p_x = \frac{13V + 11\tau}{36} \text{ and } x = \frac{47\tau - 23V}{36\tau}.$$

The resulting profit is

$$\pi_x = \frac{(13V + 11\tau)^2}{1440\tau}.$$

After substituting in the best location,  $\bar{t}_x = 1$ , or  $x = 1 - \frac{V - p_x}{\tau}$ , the boundary for this case is

$$p_x \leq \frac{27V - 11\tau}{22}.$$

The solution is interior if

$$\frac{13V + 11\tau}{36} \leq \frac{27V - 11\tau}{22} \text{ or } V \geq \frac{319}{343}\tau \approx 0.93\tau.$$

**Case (B)**  $\frac{16V - 11x\tau}{11} \leq p_x \leq \frac{3}{2}V - x\tau$

For this case,  $y$  prices such that  $\bar{t}_y = \bar{t}_x$ . The optimal  $(x, p_x)$  combination should still satisfy the condition that  $\bar{t}_x = 1$ . This gives the boundary of this region

$$\frac{27V - 11\tau}{22} \leq p_x \leq \frac{5V - 2\tau}{4}.$$

Firm  $x$ 's beset pricing is to charge  $\frac{V}{2}$  if possible.

$$\frac{V}{2} \geq \frac{27V - 11\tau}{22} \text{ if } V \leq \frac{11}{16}\tau \approx 0.69\tau.$$

For  $V \leq \frac{11}{16}\tau \approx 0.69\tau$ , firm  $x$  charges  $p_x = \frac{V}{2}$  with  $\pi_x = \frac{V^2}{2\tau}$ . For  $V > \frac{11}{16}\tau$ , the constrained optimisation is to charge  $p_x = \frac{27V - 11\tau}{22}$ .

$$\pi_x = \frac{(13V + 11\tau - 18p_x)p_x}{20\tau} = \frac{(27V - 11\tau)(11\tau - 5V)}{242\tau}.$$

In this case,

$$x = 1 - \frac{V - p_x}{\tau} = \frac{(5V + 11\tau)}{22\tau}.$$

**Case (C)**  $p_x \geq \frac{3}{2}V - x\tau$

The optimal pricing for firm  $x$  when it is a local monopolist is  $\frac{V}{2}$ . Therefore, firm  $y$  also acts as a local monopolist if

$$\frac{V}{2} \geq \frac{3}{2}V - x\tau \text{ or if } x \geq \frac{V}{\tau}.$$

When there is enough space for firm  $x$  to act as a local monopolist, there is no unique solution for the optimal location,  $x^*$ . All locations satisfying

$\underline{t}_x \geq \bar{t}_y$  and  $\bar{t}_x \leq 1$  are optimal. As noted above, the first condition,  $\underline{t}_x \geq \bar{t}_y$ , gives  $x \geq \frac{V}{\tau}$ . The second condition,  $\bar{t}_x \leq 1$ , gives

$$\frac{V - p_x}{\tau} + x \leq 1 \text{ or } x \leq \frac{2\tau - V}{2\tau}.$$

The two constraints can be satisfied simultaneously if

$$\frac{2\tau - V}{2\tau} \geq \frac{V}{\tau} \text{ or } V \leq \frac{2}{3}\tau.$$

For  $V \leq \frac{2}{3}\tau$ , both firms can act as local monopolist. For  $\frac{2}{3}\tau \leq V \leq \frac{11}{16}\tau$ , firm  $x$  acts effectively like a local monopolist while firm  $y$  prices such that  $\bar{t}_y = \underline{t}_x$ .

Therefore, the optimal  $(x, p_x)$  is

$$(x, p_x) = \begin{cases} \left( x \in \left[ \frac{V}{\tau}, \frac{2\tau - V}{2\tau} \right], \frac{V}{2} \right) & V \leq \frac{2}{3}\tau \\ \left( \frac{2\tau - V}{2\tau}, \frac{V}{2} \right) & \frac{2}{3}\tau \leq V \leq \frac{11}{16}\tau \\ \left( \frac{5V + 11\tau}{22\tau}, \frac{27V - 11\tau}{22} \right) & \frac{11}{16}\tau \leq V \leq \frac{319}{343}\tau \\ \left( \frac{47\tau - 23V}{36\tau}, \frac{13V + 11\tau}{36} \right) & \text{if } \frac{319}{343}\tau \leq V \leq \frac{47}{23}\tau \end{cases}$$

$$\pi_x = \begin{cases} \frac{V^2}{2\tau} & V \leq \frac{11}{16}\tau \\ \frac{(27V - 11\tau)(11\tau - 5V)}{242\tau} & \frac{11}{16}\tau \leq V \leq \frac{319}{343}\tau \\ \frac{(13V + 11\tau)^2}{1440\tau} & \text{if } \frac{319}{343}\tau \leq V \leq \frac{47}{23}\tau \end{cases}$$

For  $V \geq \frac{47}{23}\tau$ , the solution would not occur at  $x > y \geq 0$  and  $r_x = r_y$ . This completes the analysis for the case  $x > y \geq 0$  and  $r_x = r_y$ . ■

**Proof.** of Proposition 2

$$p_x^* = \begin{cases} \frac{3 - \sqrt{3}V}{6} & V \leq \frac{6}{9 + \sqrt{3}}\tau \\ \frac{V + \tau - \sqrt{2(8V^2 - 9V\tau + 3\tau^2)}}{5} & \frac{6}{9 + \sqrt{3}}\tau \approx 0.56\tau \leq V \leq \frac{63 - \sqrt{297}}{68}\tau \\ \frac{23V - \tau - \sqrt{48(2V - \tau)(5V + \tau)}}{49} & \frac{63 - \sqrt{297}}{68}\tau \approx 0.673\tau \leq V \leq (6 - \sqrt{24})\tau \\ 23\tau - V - \sqrt{48\tau(11\tau - V)} & (6 - \sqrt{24})\tau \approx 1.1\tau \leq V \leq \frac{11 - \sqrt{57}}{2}\tau \approx 1.73\tau \end{cases}$$

$$\pi_x = \begin{cases} \frac{V^2}{2\tau} & V \leq \frac{6}{9 + \sqrt{3}}\tau \\ \frac{3(\sqrt{2(8V^2 - 9V\tau + 3\tau^2)} + 4V - \tau)(V - \sqrt{2(8V^2 - 9V\tau + 3\tau^2)} + \tau)}{25\tau} & \frac{6}{9 + \sqrt{3}}\tau \approx 0.56\tau \leq V \leq \frac{63 - \sqrt{297}}{68}\tau \\ \frac{(9\sqrt{48(2V - \tau)(5V + \tau)} + 136V + 156\tau)(23V - \sqrt{48(2V - \tau)(5V + \tau)} - \tau)}{9604\tau} & \frac{63 - \sqrt{297}}{68}\tau \approx 0.673\tau \leq V \leq (6 - \sqrt{24})\tau \\ \frac{(V - 23\tau + 4\sqrt{\tau(33\tau - 3V)})(3\tau - \sqrt{\tau(33\tau - 3V)})}{\tau} & (6 - \sqrt{24})\tau \approx 1.1\tau \leq V \leq \frac{11 - \sqrt{57}}{2}\tau \approx 1.73\tau \end{cases}$$

$$\pi_x = \begin{cases} \frac{V^2}{2\tau} & V \leq \frac{11}{16}\tau \approx 0.69\tau \\ \frac{(27V - 11\tau)(11\tau - 5V)}{242\tau} & \frac{11}{16}\tau \leq V \leq \frac{319}{343}\tau \approx 0.93\tau \\ \frac{(13V + 11\tau)^2}{1440\tau} & \frac{319}{343}\tau \leq V \leq \frac{47}{23}\tau \approx 2.04\tau \end{cases}$$

For  $V \leq \frac{6}{9+\sqrt{3}}\tau$ ,  $x$  gets  $\pi_x = \frac{V^2}{2\tau}$  in either cases and is indifferent between offering the standard or a customised product. Firm  $y$  however, gets higher profit if  $x$  locates off the centre. For  $\frac{6}{9+\sqrt{3}}\tau \leq V \leq \frac{11}{16}\tau$ , firm  $x$  gets higher profit locating off the centre. We discuss the remaining of the cases in turn.

Case (A)  $\frac{11}{16}\tau \leq V \leq \frac{319}{343}\tau$

Firm  $x$  gets higher profit locating off the centre if

$$\begin{aligned} & \frac{(27V - 11\tau)(11\tau - 5V)}{242\tau} \\ \geq & \frac{\left(9\sqrt{48(2V - \tau)(5V + \tau)} + 136V + 156\tau\right) \left(23V - \sqrt{48(2V - \tau)(5V + \tau)} - \tau\right)}{9604\tau} \end{aligned}$$

It is difficult to sign this inequality directly. However, we can utilise a  $p_x$ ,  $\frac{23V - \tau - \sqrt{48(2V - \tau)(5V + \tau)}}{49} \leq p_x \leq \frac{V}{2}$ , such that

$$\begin{aligned} & 3 \frac{V - p_x}{\tau} (p_x) \Big|_{p_x} \geq 3 \frac{V - p_x}{\tau} (p_x) \Big|_{p_x = \frac{23V - \tau - \sqrt{48(2V - \tau)(5V + \tau)}}{49}} \\ = & \frac{\left(9\sqrt{48(2V - \tau)(5V + \tau)} + 136V + 156\tau\right) \left(23V - \sqrt{48(2V - \tau)(5V + \tau)} - \tau\right)}{9604\tau} \end{aligned}$$

for the comparison. Consider  $p'_x = \frac{20V - 11\tau}{49} \leq \frac{V}{2}$ .

$$\frac{20V - 11\tau}{49} \geq \frac{23V - \tau - \sqrt{48(2V - \tau)(5V + \tau)}}{49}$$

if

$$148\tau^2 + 204V\tau - 471V^2 \leq 0$$

This holds for

$$\frac{-51 - \sqrt{20028}}{74}V \approx -2.6 \leq \tau \leq \frac{-51 + \sqrt{20028}}{74}V \approx 1.223V.$$

Thus  $\frac{20V - 11\tau}{49} \geq \frac{23V - \tau - \sqrt{48(2V - \tau)(5V + \tau)}}{49}$  for the relevant parameter range.

$$\begin{aligned} & 3 \frac{V - p_x}{\tau} (p_x) \Big|_{p_x = \frac{20V - 11\tau}{49}} = \frac{(29V + 11\tau)(20V - 11\tau)}{2401\tau} \\ & \frac{(27V - 11\tau)(11\tau - 5V)}{242\tau} \geq \frac{(29V + 11\tau)(20V - 11\tau)}{2401\tau} \end{aligned}$$

if

$$261239\tau^2 - 869110V\tau + 464495V^2 \leq 0.$$

This holds for

$$\frac{39\,505 - \sqrt{557\,800\,320}}{23\,749}V \approx 0.67V \leq \tau \leq \frac{39\,505 + \sqrt{557\,800\,320}}{23\,749}V \approx 2.66V$$

This holds in the relevant parameter range. Therefore

$$\begin{aligned} \frac{(27V - 11\tau)(11\tau - 5V)}{242\tau} &\geq 3 \frac{V - p_x}{\tau} (p_x) \Big|_{p_x = \frac{20V - 11\tau}{49}} \\ &> 3 \frac{V - p_x}{\tau} (p_x) \Big|_{p_x = \frac{23V - \tau - \sqrt{48(2V - \tau)(5V + \tau)}}{49}} \end{aligned}$$

and  $\pi_x(x > 0) > \pi_x(x = 0)$ .

Case (B)  $\frac{319}{343}\tau \leq V \leq (6 - \sqrt{24})\tau$

Firm  $x$  prefers locating off the centre if

$$\begin{aligned} &\frac{(13V + 11\tau)^2}{1440\tau} \\ &\geq \frac{(9\sqrt{48(2V - \tau)(5V + \tau)} + 136V + 156\tau)(23V - \sqrt{48(2V - \tau)(5V + \tau)} - \tau)}{9604\tau} \end{aligned}$$

Given the complicated expression of the equilibrium price imposed by the price undercutting constraint when  $x = 0$ , we cannot sign this inequality directly. However, given the shape of the profit function, we can sign this inequality by working with a  $p_x$  close enough to the equilibrium price,  $\frac{23V - \tau - \sqrt{48(2V - \tau)(5V + \tau)}}{49}$ .

Recall that  $p_x = \frac{23V - \tau - \sqrt{48(2V - \tau)(5V + \tau)}}{49}$  solves

$$3 \frac{V - p_x}{\tau} (p_x) = \frac{(V + \tau + p_x)^2}{16\tau}.$$

The profit function  $3 \frac{V - p_x}{\tau} (p_x)$  attains its maximum at  $p_x = \frac{V}{2}$ . Therefore, for  $\frac{23V - \tau - \sqrt{48(2V - \tau)(5V + \tau)}}{49} \leq p_x \leq \frac{V}{2}$ , the profit level increases in  $p_x$ .

Consider  $p'_x = \frac{23V - \tau}{49}$ . Since  $\frac{23V - \tau - \sqrt{48(2V - \tau)(5V + \tau)}}{49} \leq \frac{23V - \tau}{49} \leq \frac{V}{2}$ ,

$$3 \frac{V - p_x}{\tau} (p_x) \Big|_{p_x = \frac{23V - \tau}{49}} = \frac{3(26V + \tau)(23V - \tau)}{2401\tau}$$

$$\frac{(13V + 11\tau)^2}{1440\tau} \geq \frac{3(26V + \tau)(23V - \tau)}{2401\tau}$$

if

$$294\,841\tau^2 + 699\,646V\tau - 2177\,591V^2 \geq 0.$$

This holds for

$$\frac{-349823 - \sqrt{764419239360}}{294841}V \approx -4.15V \leq \tau \leq \frac{-349823 + \sqrt{764419239360}}{294841}V \approx 1.78V$$

This holds in this parameter range and therefore  $\pi_x(x > 0) \geq \pi_x(x = 0)$ .

$$\text{Case (C) } (6 - \sqrt{24})\tau \leq V \leq \frac{11 - \sqrt{57}}{2}\tau \approx 1.73\tau$$

Firm  $x$  prefers locating off the centre if

$$\frac{(13V + 11\tau)^2}{1440\tau} \geq \frac{(V - 23\tau + 4\sqrt{\tau(33\tau - 3V)})(3\tau - \sqrt{\tau(33\tau - 3V)})}{\tau}$$

Recall that the  $p_x(x = 0) = 23\tau - V - \sqrt{48\tau(11\tau - V)}$  solves

$$3p_x = \frac{(V + \tau + p_x)^2}{16\tau}$$

We can pick a higher price for comparison. Let  $p_x = 2\tau$ .

$$2\tau \geq 23\tau - V - \sqrt{48\tau(11\tau - V)}$$

if

$$V \leq (-3 + \sqrt{96})\tau \approx 6.8\tau.$$

$$\frac{(13V + 11\tau)^2}{1440\tau} \geq 3p_x|_{p_x=2\tau} = 6\tau$$

if

$$169V^2 + 286\tau V - 8519\tau^2 \geq 0.$$

This holds for

$$V \leq \frac{-11 + \sqrt{8640}}{13}\tau \approx 6.3\tau.$$

This holds. Therefore,  $x$  would always prefer to locate off the centre. ■

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厚生労働科学研究費補助金（政策科学総合研究研究事業）  
「社会保障と経済の相互関係に関する研究」  
各論

「世代間所得分配の政治経済学に関する研究」

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**研究要旨** 2005年の等価再分配所得の総人口平均の304万円に対し、こどものある世帯は294万円である。日本で子供がいる家庭が、退職者に比べ恵まれていないことを示しているといえる。一方、1989年の「ひのえうまショック」以来、少子化対策が必要であるといわれてきた。子供のいる家庭へ資源が移転されないのには政治的な理由が考えられる。具体的には有権者の年齢分布である。実際、平成17年国勢調査を基に計算すると、約24%の有権者は18歳未満の子供を持つ親であるのに対して、55歳以上の有権者、つまり年金支給に強い関心を有する層は43%を占める。次世代が選挙で反映するような制度を考えてみる。すると、親の票の割合が37%に増加して、55歳以上の票が全体の35%になる。次世代への資源の移動が起こりやすくなると考えられる。

A. 研究目的

この20年間少子化が問題視されてきたにもかかわらず、公的家族支援や年齢別所得再分配をみると、次世代に資源が十分配分されていないことがわかる。選挙では年金と医療といった高齢者のための政策が台頭を続けていることから、政治的な問題としてとらえて分析する。背景として、世代間所得再分配が現在の政治制度ではうまくいかない理由が考えられる。というのは、すべての世代が参政していないためである。つまり高齢者には選挙権があるが、未成年者には選挙権がないからである。この非対称性を是正する政治的な解決方法を検討する。

B. 研究方法

まず、厚生労働省『所得再分配調査』の「世帯員の年齢階級別所得再分配状況（等価所得）」を使って、世代間の所得再分配の実態を把握する。『国勢調査』の世帯の家族類型（16区分）別世帯員数を使って、現在選挙制度下での親及び55歳以上の票の全有権者票の中での割合を計算する。さらに、同じ割合は仮想選挙制度下で計算する。政治的に実行できる施策に変化があるか検討する。

C. 研究結果

第一に、平成17年国勢調査では有権者年齢

の中位値は51歳であるが、15年後には65歳が中位値になる。人口の半分が年金受給者になる。一方、次世代をになう20歳未満の人口は全体の37%であるが、選挙権がない。

第二に、平成17年国勢調査と社会保障・人口問題研究の資料を基に計算すると、約24%の有権者は18歳未満の子供を持つ親である。一方、55歳以上の有権者、つまり年金支給に強い関心を有する層は有権者の43%を占める。

第三に、未成年者も票をもつが、親が代わりに投票するというデーメニ投票法を考える。おなじ統計を使って計算すると、この投票法は親（と子供）の有権者層を全体の37%に増やし、55歳以上の有権者層を35%に減らすことがわかった。

D. 考察

従来日本の家族は世代間の所得再分配を、家族の枠組みの中で行ってきた。しかし、所得再分配に関して、政府が増々重要な役割を果たすようになってきた。よって、各世代が政治の場で代表されることが大切になってきたのである。現在の政治制度では、子供の世代が不平等に不利になり、権利を奪われる危険にさらされている。さらに、子供からの将来の税金が高齢者の年金を支えるように頼りにされ、子供らはその支援をするために懸命に教育を受ける努力をしているとすれば、「代表

なくして課税無し」という古くからの格言は、この問題に深く関係するという議論も事実可能である。

#### E. 結論

デーメニ投票法によって、二つの世代間のバランスがとれるようになり、家族政策が国政選挙で真剣に議論されるようになると考えられる。デーメニ投票法導入による有利点として、さらに子供に対する補助金を政府が信憑性を維持しながら長期にわたり継続する仕組みができることが挙げられる。日本の家族政策の歴史は一貫性を欠いてきた。子供を持つ決断には長期的な展望が必要であり、政策が長続きすると人々が信じない限り、出産率が家庭優遇政策に呼応する可能性は低い。子供の利害が選挙に反映されやすいようにすることで、社会保障費用が上昇する中、日和見的な政策努力の低下が防げると推測する。

#### F. 健康危険情報

該当しない。

#### G. 研究発表

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H. 知的財産権の出願・登録状況  
該当しない。



**Political Economy of Low Fertility and Changing Population Age Structure  
- Case of Japan**

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**ABSTRACT**

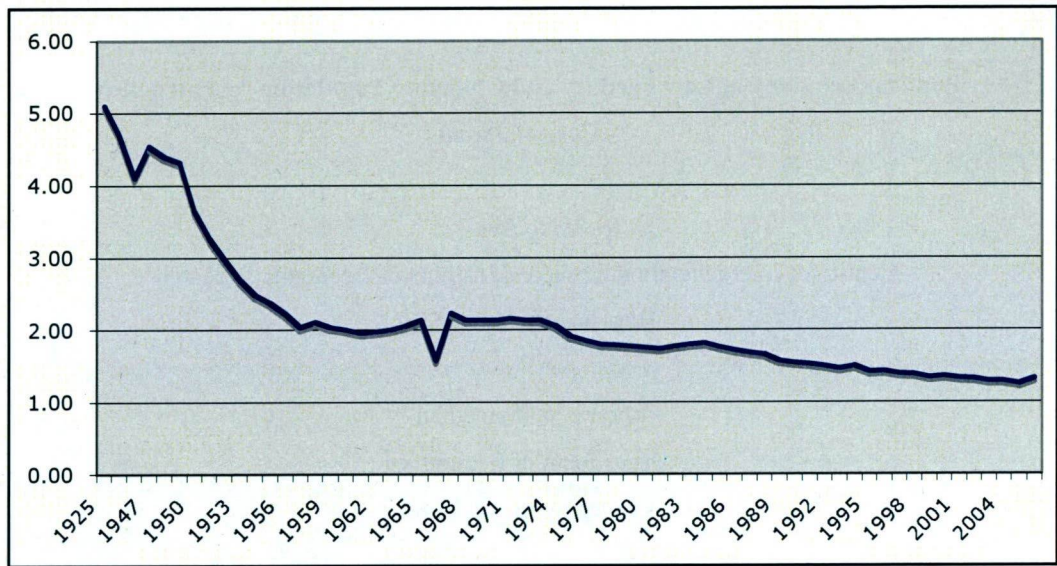
Japan has the oldest population and one of the lowest fertility rates in the world. Despite the well recognized need for pronatalist policies, Japan lags behind other developed countries in the generosity of its family benefits, due in part to the large voting bloc of those in, or close to, retirement, and the weak political power of parents and children. Intergenerational redistribution of income has become public policy and object of political debate, but not all generations have political representation. We argue that to reverse the trend, Japan should introduce a Demeny Voting rule, which allows parents to vote on behalf of their children. Such a change would signal a commitment to ongoing generous family policies which in turn would increase fertility.

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<sup>8</sup> We are grateful to Chiaki Moriguchi, Matthew Ryan and Warren Sanderson for their advice at various stages of our work. Rhema Vaithianathan grateful for the generous hospitality of the Institute of Economic Research, Hitotsubashi University.

## Introduction

The problem of low and declining fertility in the Japanese population, coupled with long life-expectancy, has meant that Japan's proportion of population over 65 years is the highest in the world (Ogawa *et al.*, 2008). The post-war decline in fertility was also one of the most rapid in the world (Figure 1). However, despite the recognition by Japan since the 1980s of the need to increase fertility rates, Japan has been very slow to institute family friendly policies.



**Figure 1: Total Fertility Rate,<sup>9</sup> 1925 – 2006**

Source: National Institute of Population and Social Security Research. The data for 1947-1972 do not include Okinawa Prefecture.

In Japan, as in all Parliamentary democracies, children are the one exception to the rule of “no taxation without representation”. Japan, with a minimum voting age of 20, is at the extreme end of democracies in terms of the age of enfranchisement. In Japan, 20 years coincides with the age at which people are allowed to purchase alcohol or tobacco. However, men may legally marry at 18 – meaning that there are many households in Japan where no-one in the household is eligible to vote.

This has led to recent discussion in Japan of whether the voting age should be lowered and the new law for national referendums defines the voting age as 18. In this paper we suggest that the recent

<sup>9</sup> The “total fertility rate” measures the average number of children a woman would be expected to have over her lifetime.

interest offer an opportunity to consider more radical reform. We argue that the lack of political will on the part of successive Governments to address the need for better family policies is due to the fact that families with young children form such a small and shrinking voting bloc in Japan.

We propose that Japan should consider adopting a “Demery voting” system, under which parents are given proxy votes for their children until they reach a certain age (such as 18). Demery (1986) suggested this as an admittedly radical approach to encouraging pronatalist policies. Sanderson (2007) takes up this suggestion as a way of off-setting the ageing population and the political impediments to pension reform in countries such as Germany and Japan where there is a large and growing percentage of the population who are above pension age.

Throughout history voting rights have been extended in response to economic changes because there incumbent voters find it beneficial to acquiesce and give up some political power. The rich elite found it necessary to give the poor voting rights in order to prevent a outright revolution in 19<sup>th</sup> century Europe (Acemoglu and Robinson (2000) ). Women were given rights as a way of enlisting them to undertake human capital investment i.e., raise children, when demand for trained workers emerged (Dodepke and Tertilt (2009)).

The new environment facing Japan is the change in age distribution due to low fertility and longevity. At the same time families are more nuclear consisting of at most two generations, parents and young children. This has caused intergenerational redistribution of resources to be public policy matter. But not all generations have equal political representation, namely children have no voice. There is a free riding problem among the elderly – while each person is aware of benefit of investing in children, no one is willing to bare the cost. The older generation may find it beneficial to give the younger generation votes to resolve this problem. Demery voting will be commitment by society as whole to guarantee distribution to the very young.

### **Sub-Optimal Fertility and Pay as You Go Social Security (PAYG)**

The important question for many demographers is whether the decline in fertility will continue unabated. Authors such as Lutz, Skirbekk and Testa (2005) argue that there are conditions under which below replacement fertility levels would be a long term stable equilibrium, in effect trapping the economy into below-replacement fertility and a declining population.

However, one could ask: if low fertility does not correct itself and population levels fall, is this really a problem? As Warren Sanderson points out, Japan's currently projected population in 2050 is the same as its population in 1965 (Sanderson, 2009). To the extent that the 1965 population was viable and acceptable to Japan, declining population ought not to be, *ipso facto*, a reason to support population policies.

It is not purely population size that is at issue. Low fertility and long life expectancy mean that the Japanese population will not just shrink, it will also age. At a fertility rate of 1.39, the old-age dependency ratio (the ratio of those aged over 65 to the working aged population) is expected to double from 34 in 2009 to 76 in 2050 (Kaneko *et al.*, 2008). Moreover, Japan's elderly rely heavily on a PAYG public pension system, which is funded through pension contributions of those of working age (Ogawa *et al.*, 2008). The PAYG system under such large dependency ratios starts looking very fragile, possibly leading to its demise. Recently, some younger Japanese have refused to contribute to the pension, arguing that the demographic squeeze means that there would be no pension when they retire even if they continue to contribute.

With globally integrated labor markets, however, using projected dependency ratios alone to estimate the magnitude of the social security deficit is misleading. With a sufficiently flexible immigration policy, we would expect that as the locally born working age population declines and the capital-to-labor ratio rises, there will be an increase in immigration from countries with a surfeit of young workers and a deficit of capital (Sinn, 1997). However, there are claims that the size of immigration required to correct for the worsening dependency ratio is very large and therefore unlikely to occur. Japan is estimated to need around 600,000 net immigrants per annum through to 2050 in order to maintain the dependency ratio at its 1995 level (UN, 2000). Additionally, Japan has long been reluctant to utilize immigration as a device to correct for the ageing population and has traditionally had high barriers to naturalization.

From an economic welfare point of view, the question is not whether fertility rates are above or below replacement level, but rather whether the private costs and benefits of having children deviate from its social costs and benefits. In other words, is there "market failure" in the child bearing decision? Given that the incentive for children are heavily influenced by economic policy such as housing, taxation and employment, the salient question is not whether population will fall or dependency rates will rise, but whether there are distortions in the economy which keep fertility below optimal levels.

Many of the private costs of having children (medical care and schooling) are not faced directly by parents, so one could argue that children are “subsidized”, leading to higher levels of fertility than would occur in a “free market” (Palvios and Scotese, 1996). On the other hand, in a PAYG system, the benefits derived from having children are also taxed. In particular, when children enter working age, their taxes will be used to support retirees’ pensions and health care costs regardless of whether those retirees had children themselves. Public access to social security no longer depends on whether one has children. As long as others are having children, old age security is assured through the tax and transfer system. Moreover, any additional financial support that one’s own children provide is paid from their after-tax income, reducing the children’s willingness to support parents.

As long as child-rearing is costly, there exists an incentive for adults to free-ride on other’s children. With a PAYG pension system, this implies that, in general, fertility rates will be lower than optimal.

Van Groezen, Leers and Meijdam (2003) model this externality effect of children and show how a child-care subsidy is needed in order to internalize the external benefits conferred by having children. Such a subsidy is Pareto improving. Interestingly, they also argue that once society has adopted a PAYG system, reduction in pensions *per se* does not solve the problem of inadequate fertility. Under a PAYG scheme, pension reform always leads to one cohort suffering a loss – this is the cohort who pay retirees the higher pension while working, but are paid a lower pension when they themselves retire. To compensate this cohort, Government debt will have to rise. However, such a rise is perfectly off-set by the rise in future taxes required to pay the debt and its interest. They show that this debt matches the gain from pension reform, leaving fertility rates unchanged. This suggests that recent discussion of pension reform might be misdirected.

To solve the market failure requires an instrument which allows taxes or subsidies to be a function of the number of children a person has. Child care subsidies do exactly that – while pension reforms (unless they are reforms aimed at allowing pensions to vary with the number of children) do not.

Indeed, in our opinion there is an excessive focus on pension reform in Japan and an inadequate focus on fertility policies.

### **Family Policy and Fertility**

The question then is whether Japan provides a subsidy to children which is sufficient to off-set the costs of raising children and also to internalize the sizeable externality that bearing children has on restoring the viability of the pension system.

One approach to measuring the extent to which children are subsidized is to compare the average fertility rate with the desired fertility rate (ideal family size). If we interpret the desired family size as the number of children at which the respondent is satiated, then the gap between desired and actual is a measure of the price of children faced by parents.

Table 1 provides survey data for Japan on the ideal family size. It comes from the five-yearly fertility survey of married persons conducted by the National Institute of Population and Social Security Services Research. The sample size ranges from 5,603 to 8,624 (depending on the year).

	1977	1982	1987	1992	1997	2002	2005
<b>Ideal Number (1)</b>	2.42	2.49	2.51	2.4	2.33	2.31	2.3
<b>Actual Fertility Rate (2)</b>	1.8	1.77	1.69	1.5	1.39	1.32	1.26
<b>Difference (1 -2)</b>	0.62	0.72	0.82	0.9	0.94	0.99	1.04

**Table 1: Ideal Family Size and Fertility Rates, Japan 1977- 2005**

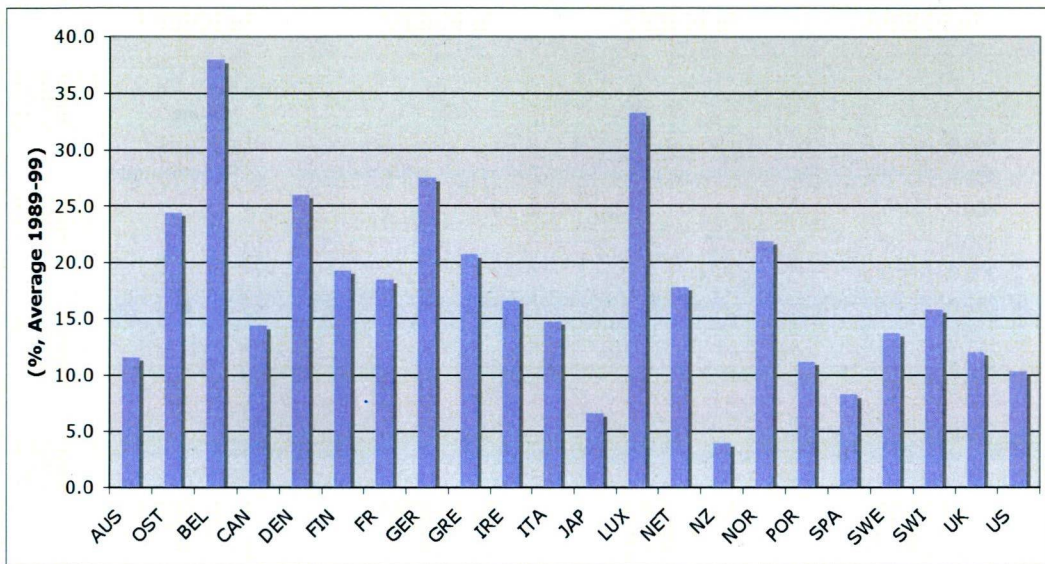
In most developed countries, achieved fertility is considerably lower than ideal fertility rates. While the ideal number of children in Japan is comparable to the 2006 EU average of 2.3, in Japan the gap between the fertility rate and the ideal family size has been steadily expanding between 1977 and 2005. Actually fertility has dropped by 0.54 children but ideal family size had dropped by only 0.12. This suggests that the “cost” of raising children over this period has increased.

The gap between fertility and desired family size is also a measure of the extent to which pronatalist policies such as subsidized child care or child cash benefits could be expected to increase fertility.

The financial costs of raising children in Japan were estimated at ¥832,000 per annum in 2002 (Cabinet Office, 2002). Given the positive externalities arising from children in a PAYG system, one would expect these private costs to be offset by the tax and transfer system. An “idealized”

tax-transfer system should redistribute towards households with young children through child-related support, and towards older people through social security payments.

Figure 2 gives the average additional disposable income (after taxes and cash transfers) of a one-earner, two-parent, two-child family as compared to the disposable income of a childless single earner (expressed as a percentage of the disposable income of the childless single earner.) We provide the average for the 1989–99 decade. All reported countries are over 0, implying that they transfer in favor of families with a non-earning spouse and children. The average for all countries is 18%, but Japan’s rate over this period is 6.5%, the second-to-lowest in the sample.



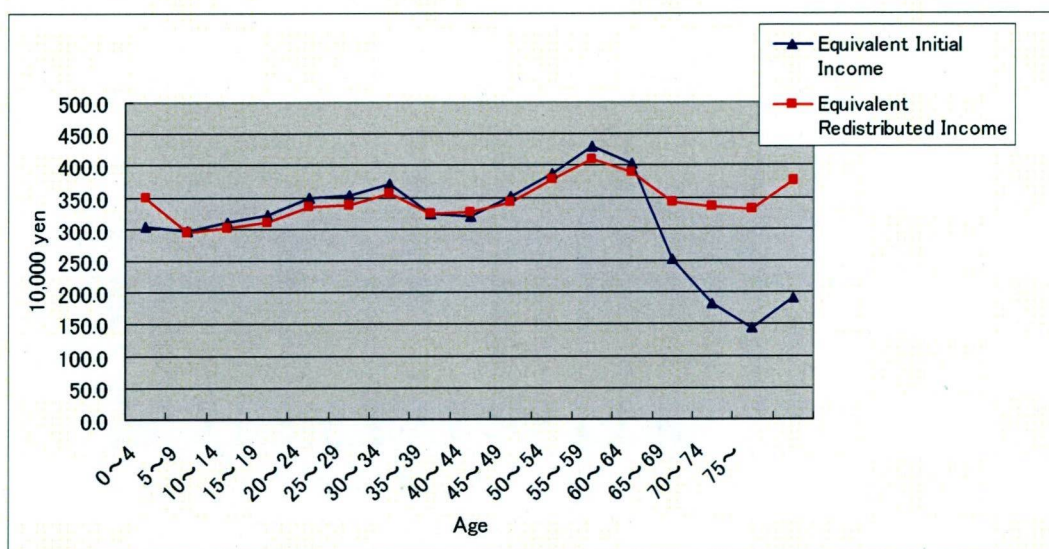
**Figure 2: Pro-family Transfers in OECD Countries (Average 1989–1999)**

Source: Gauthier (2003).

The low level of transfers for families with children is reflected in the low equivalent incomes of families with young children. In Figure 3 we plot the 2005 equivalent household income (household income divided by the square root of the number in the household) before taxes and transfers (“Initial Income”) and after all taxes and transfers (“Redistributed Income”) by age of household member.<sup>10</sup> The data is based on a survey of 5,688 households. Redistributed income deducts all taxes and social security premiums for healthcare, long-term residential care and pensions paid by the household, and adds all in-kind benefits, including transfers, pensions, medical care, long-term and home child care.

<sup>10</sup> That is, for each age group, the figure reports the average equivalent household income over all households occupied by persons in that age group.

The size of the difference between redistributed and initial income indicates the extent to which that age group is taxed or subsidized. If parents are rewarded for having children, we would expect to see children's redistributed income being higher than initial income. Overall, Japanese children live in households which *pay* tax rather than receive a subsidy and they also have the lowest equivalent income of any age group – including retirees (¥2.94m versus the average across the population of ¥3.04m). While the high levels of equivalent incomes amongst retirees as opposed to children is partly due to the fact that medical expenditure (which is concentrated in old age) is included whereas publicly funded education is not, the data does provide evidence that in Japan, families with young children are badly off compared to retirees.



**Figure 3: Equivalent Household Income, Japan (2005)**

Source: Income Redistribution Survey, Japanese Ministry of Health, Labor and Welfare

The Japanese Government has long been aware of the need to improve family policy and low fertility rates. In 1989, for instance, there was a public outcry when for the first time, the fertility rate fell below its 1966 level, the last Hinoe-uma year (meaning Year of the Horse). In Hinoe-uma years, people avoid having children due to the superstition that one should not marry people born in that year (see the large downward spike at 1966 in Figure 1). While people expect Hinoe-uma years to exhibit low fertility, to observe normal year fertility rates below a Hinoe-uma year shocked the Japanese.



Government responded to the growing concerns over low fertility with the 1994 “Angel Plan”, which included an expansion of child allowances, an increase in the number of day-care facilities for 0 to 2 year olds, and an extension of the hours and range of services offered by these facilities (Cabinet Office, 2009).

In 1999, as fertility rates continued to drop, there was the New Angel Plan. This included changes to employment regulations, the introduction of mother-and-child health and advice centers and the provision of education in addition to day-care centers.

In 2004, the Government launched a pro-family “declaration” which attempted to set out four crucial for promoting families and increasing fertility. This was termed the “Shoshika Shakai Taisaku Taiko” which translates as a Social Plan for Low Fertility. This plan emphasized (1) increasing the independence of young people; (2) re-evaluation of work to promote co-existence of work and family; (3) understanding the value of life and the family; and (4) new support and solidarity for raising children

While these were high-sounding principles, the policy interventions were slow in coming and inadequate. Family-related public assistance in Japan continues to lag the rest of the OECD. Japan spends only 0.75% of GDP, compared to 1.21% in Germany, 3.54% in Sweden, and 3.93% in England (Ministry of Health, Labor and Welfare, 2009).

Services for children are also struggling. For example, provision of pre-school centers continues to be inadequate. The waiting list for entry into an accredited nursery is reported to be 360,000 in Tokyo alone (Editorial, Kyodo News, 8 June 2009).

Prime Minister Taro Aso announced low fertility as one of his priority areas. In his 2008 budget, the following measures were announced:

- a fund to increase the number of day-care centers;
- increased subsidies for health checkups for pregnant women;
- a one-off payment for families with more than 2 children: ¥36,000 yen (US\$367) for each child aged between 2 and 5.

These are short term measures which apply to the 2008-09 fiscal year.

The question of the extent to which family policies increase fertility has been well researched. There is now considerable evidence that family-friendly policies including direct cash transfers and tax advantages increase fertility, although the size of the effect is debated (Holtz, Klerman and Willis, 1997). Recent evidence from a single payment offer of up to CAN\$8,000 in 1997 (approximately ¥900,000 in 2009 Yen) was shown by Kevin Milligan (2005) to have large effects on fertility. He finds that fertility increased on average by 12%, and amongst those eligible to receive the maximum payment, fertility rose by 25%.

Feyrer, Sacerdote and Stern (2008) use OECD data to perform cross-country regressions on the effect of public expenditure on children on fertility rates. They find that a 1% point increase in spending as a percentage of GDP is associated with an increase of 0.12 children per woman. They also find that of all types of public expenditure, the provision of free day-care for young children is the most effective, with an increase in fertility of 0.13 for every additional 1% point of GDP spent on day-care. They conclude that the effect of pro-family policies on fertility are quite strong, and might be due not just to the direct effect of lowering the costs of bearing children but also to the additional “demonstration” effect of having many friends and family who also have young children.

### **The Greying Voter Problem in Japan**

Previous theoretical and empirical work has established a positive correlation between the age of the median voter and the fraction of GNP spent on pensions (Tabellini, 1990; Breyer and Craig, 1997). The median age of the Japanese voter is 51 years and will increase over the next 15 years. The existence of this strong elderly voter bloc implies that any re-direction of public resources from the elderly to the young will face political difficulties.

To get an idea of how strong the elderly are in determining party platforms in Japan, we list the LDP party manifestos for the 2003, 2005 and 2007 parliamentary elections in Table 2. The LDP became the governing party in all these elections. Two of the three election manifestos lead with pensions as the principal issue, and there is no mention of child or family policies at all – despite the general consternation and numerous working parties publishing “White Papers” on the issue.

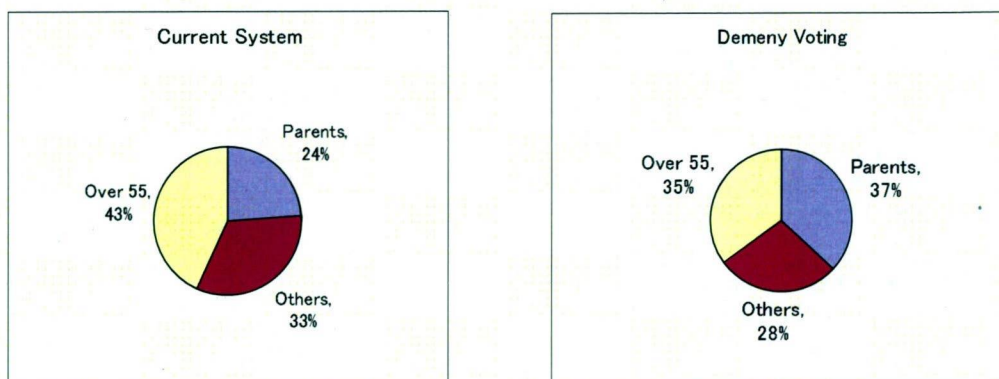
2007	Pensions Civil Service Reform Education
2005	Privatisation International Competitiveness Civil Defence
2003	Pensions & Health National Security Privatisation

**Table 2: Top Issues for LDP Manifesto in National Elections**

Source: LDP Manifestos, various years.

The most recent example of redistribution is the proposal to “tax” existing insurance plans that have large surpluses ( “Koureishairyouzaigen Shikumi Minaoshi - Kouroushou Kentou” ( Re-examination of elderly health insurance funding considered by Ministry of Health, Labor and Welfare) June 19, 2009). If implemented, this will increase burden on insurance plans for “salary man” who have a retirement age. This proposal exacerbates the redistribution from the young to the old, because the insurance plans that will be taxed the most will be those that have low numbers of elderly and therefore small pay-outs relative to their premium income.

Using the 2005 household census we calculate that approximately 24% of eligible voters are parents of children under 18 years of age. On the other hand, those who are concerned about pension levels (i.e., those aged over 55), constitute 43% of the voters and are therefore more powerful in the minds of politicians. This latter group gain nothing from increasing fertility since any children born will not be productive in time to support their retirement. Indeed, children who are born will be an additional drain on public expenditure leading to potential reduction in social security payments.



**Figure 4 Current Electoral System<sup>11</sup> and Demeny Voting**

Source: 2005 Census, Ministry of Internal Affairs and Communication

In light of the lack of political will or interest in improving family policy, Japan should consider Demeny voting, which allows parents to cast a proxy vote on behalf of their children (Demeny, 1986). This would automatically increase the voting power of parents. By our calculation, it would increase the parent-bloc to 37% and reduce the over-55-years bloc to 35%, thus creating a more balanced incentive for politicians to take family policy seriously.

The major advantage we see is that this provides a commitment device by which Government can make a credible long-term commitment to subsidizing children. The history of family policy in Japan has been inconsistent. The decision to have children is a long-term commitment, and it is unlikely that fertility will respond to pro-family policy unless people believe these policies will continue. A constitutional change which expands franchise to children will prevent the arbitrary erosion of commitments as social security costs rise.

Historically, Japanese families have effected inter-generational redistribution within the family structure, thorough a multi-generational structure to the family. However, the Government has played an increasingly important role in this re-distribution (Yamato, 2006). This makes it vital that each generation has “equal political representation”. Under the present political system, the children’s generation risk getting unfairly disadvantaged and disenfranchised. Indeed, one could argue that given that the future taxes from children are being relied upon to support the pensions of the old, and that children work extremely hard educating themselves in order to be able to provide

<sup>11</sup> The legal voting age is currently 20. However census only identifies children under 18 years of age (living with parents). Thus “parents” are only those with children under 18 and total number of voters is people 18 and over in Figure 4.