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BEQUESTS, CONTROL RIGHTS, AND COST-BENEFIT ANALYSIS*

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Abstract

Consider a public project which produces a consumption good and which benefits future generations. Let a conventional cost-benefit analysis find that it gives higher benefits than projects it would dis-place in the private sector. Voters may nevertheless oppose the public project: the combination of a desire to control bequests and the lack of control over who gets benefits from a public project makes the public project unattractive. In contrast, private projects have owners, allowing parents to control whether their children will receive the benefits from such projects. Parents can therefore better influence the behavior of their children when they have the option of giving the children title to private projects.

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1 Introduction

A large literature discusses the discount rate government should use in evaluating public projects. Most analyses implicitly assume that the same discount rate can be used for projects that impose costs and generate bene…ts to the current generation as for projects that impose costs on one generation but give bene…ts to future generations. Programs with such delayed bene…ts are increasingly important, particularly in environmental policy. Thus, reductions in carbon or CFC emissions impose costs on persons now alive, and will bene…t people not yet born.

When capital and other markets are perfect, who will be alive when bene…ts appear is irrelevant. We shall show, instead, that generational di¤erences do matter when considering public projects that yield bene…ts to a future generation.

Our essential idea is that a parent who wants to induce particular behavior by a child may do so by conditioning a bequest on the child's behavior, and that such inducement is more e¤ective if the parent controls the assets than if the parent spends some assets on a governmentally-controlled project.

Consider a parent evaluating a tax increase to fund a government program that would reduce carbon emissions. The program has no immediate e¤ects, but will bene…t the next generation. Suppose that standard cost-bene…t analysis, which compares the present discounted value of social costs and bene…ts, calls for undertaking the program. Let consecutive generations, say parent and child, implicitly bargain over how much services the child provides the parent in exchange for a bequest. We shall show that the parent may oppose even a costless public investment that bene…ts the child. The opposition arises because the bene…ts of the public project increase the child's income, which is her threat point when bargaining with the parent, and so reduces the parent's utility after the bargaining.

The parent's interest in her child's behavior can be paternalistic. A mother may want her daughter to avoid drug use, marry within the religion, or complete a college degree. Or the motive may be sel…sh, with a mother wanting her daughter to take care of the mother in her old age. Since the literature has considered in depth the last motive, we shall mostly speak here in terms of it.

Thus, we largely follow Bernheim, Shleifer, and Summers (1985), Cox and Rank (1992), Cremer, Kessler, and Pestieau (1992), and Cremer and Pestieau (1991) in supposing that parents leave bequests to their children because they want to obtain services (such as care) from their children. We shall also consider limited altruism, with the mother demanding less attention from her daughter, or leaving a larger bequest, than pure sel…shness would dictate.

Bernheim, Shleifer, and Summers (1985) provide strong evidence for the strategic bequest motive, …nding in particular that attention to parents by children increases with bequeathable wealth, but decreases with non-bequeathable wealth. A novel element of our analysis is to consider a public project as generating non-bequeathable wealth.

Also consistent with the strategic bequest model, Borsch-Supan, et al. (1992) …nd that children who earn higher wages spend less time with their elderly parents. Laitner and Ohlsson (2001) study Sweden and the United States, …nding that parental bequests increase with the parents' lifetime resources, and decline with the earnings potential of the heir. These results are consistent with both an altruistic motive and a strategic bequest motive, but, the authors state, perhaps better …ts the strategic bequest motive. Hochguertel and Ohlsson (2000), who examine pre-death gifts made by parents, also reach conclusions consistent with the strategic bequest model: in the United States a child is more likely to receive a gift if she works fewer hours and has lower income than her brothers and sisters.

Some recent works, however, question the hypothesis: in the United States children's provision of care to parents is little guided by a strategic bequest motive. (See Perozek (1998, who unlike Bernheim, Shleifer, and Summers (1985) controls for the number of children in a family, and Sloan, Picone, and Hoereger (1997) who study the amount of time children devote to disabled elderly parents).

The strategic bequest motive appears far stronger outside the United States. Horioka et al. (2000) compare the responses of survey respondents in the United States and Japan. In one question, respondents were asked whether no strategic considerations entered in bequests. In the United States 43 percent of respondents held the view "I want to make e¤orts to leave behind a bequest regardless of whether my child or children look after me

after I retire;" in Japan only 20 percent of respondents agreed with this non-sel…sh view. In Japan 33 percent of repsondents said that "Most or all of [the bequest] will be willed to the child or children who look after me;" only two percent held this view in the United States.

Parents who make bequests for non-strategic reasons need not favor private investment over public investment. But the evidence suggests that a good number of parents view bequests, at least in part, as giving leverage over their children; to understand the behavior of such parents we should look at the di¤erence between private and public investments. The owner of a private investment can control the conditions under which her heirs will receive the proceeds from that investment. In particular, she can deny a bequest to a child who neglects her. In contrast, an individual cannot control who bene…ts from a public investment. The bene…ts may be a non-excludable public good, so that all members of a future generation receive the bene…ts. In other words, parents cannot use a public investment to purchase care from children.

Similar results obtain under a somewhat di¤erent interpretation of why children may care for their parents. Suppose credit markets are imperfect and parents are uncertain about their future …nancial needs, so that they do not always consume all assets during their lives. Suppose further that the value of the asset, say a house, is greater if well-maintained. Then children may visit their parents, paint the house, call the plumber, and so on, with the sel…sh intent of increasing the asset they will inherit. The child, therefore, does not worry that a parent formally changes the bequest speci…ed in a will, but provides services for the parent as a by-product of preserving the parents' assets.[1]

2 Assumptions

For simplicity we consider asexual reproduction—each mother has one daughter; neither sons nor fathers are considered. Each person lives for two periods. In period 1 she serves her mother. In period 2 she enjoys services provided

[1] This asset-preservation motive may explain why, as Sloan, Picone, and Hoerger(1997) …nd, the informal care children provide their parents does not vary with the cognitive awareness of the parents.

by her daughter. Payment for the services comes from an inheritance. We shall …rst consider purely sel…sh individuals, and then extend the model to consider altruistic individuals.

Consider a person born in year t. In period 1 of her life she provides services to her mother in the amount z_1^t. In period 2 she receives services from her daughter in the amount z_2^t, which equals z_1^{t+1}. The utility function of a person born in period t is

$$U^t(z_1^t; z_2^t); \tag{1}$$

where $@U^t=@z_1^t < 0$ and $@U^t=@z_2^t > 0$. The notation U^t clari…es the identity of the person under discussion. We assume, however, that all persons, in all generations, have the same utility function.

A mother enjoys services from her daughter, but buys no services on the market. Market purchases may be ruled out because the daughter can better care for her mother than can anyone else. Or the child can give a speci…ed quality of care at lower cost than can anyone else. Because of such e¢ciency gains, a sel…sh mother would not want to hire a nurse for care, but would instead want to induce her daughter to provide care.

3 The basic model

The basic model ignores consumption, saving, and investment. A person born in year t inherits a bequest of B in year t + 1. She can use this bequest to buy services from her daughter in year t + 1.

Consider a steady-state solution with each person providing services $z^¤$ to her mother and receiving services $z^¤$ from her own daughter. Figure 1 measures z_1 along the horizontal axis and z_2 along the vertical axis. Since z_1 is a bad and z_2 is a good, the indi¤erence curves slope upward. The usual assumptions of decreasing marginal utility of services received, and increasing marginal disutility of e¤ort provided, mean that the indi¤erence curves are strictly convex (steeper as we move to the right).

In Figure 1 the indi¤erence curve through the origin is ‡atter than the 45^o line. Alternatively, the slope of the indi¤erence curve through the origin can exceed 1; that is, individuals can demand large services when they are old in return for providing services when they are young.

Clearly, one possible value of z^{α} is 0; both the mother's bequests and services from the daughter are zero. This is the only possible equilibrium when the indi¤erence curve through the origin is steeper than the 45^{o} line. This equilibrium also determines the reservation utility $U(0;0)$, relevant when considering possible equilibria with positive bequests and services.

Figure 1 shows a di¤erent solution, where z^{α} is determined by the intersection of the 45^{o} line through the origin with the indi¤erence curve through the origin. The intersection lies at point X on indi¤erence curve U^{X}; each daughter provides z_1^{X} in services and receives that amount when she is old. This point represents a possible steady-state equilibrium, where a typical person's utility is the same as the reservation utility: trade between a mother and her daughter yields no net bene…t.

A third, and more e¢cient, steady state is also possible. This is represented by the point on the 45^{o} line through the origin that is tangent to an indi¤erence curve, shown as Y on indi¤erence curve U^{Y}. This point represents a higher utility than obtains at points X and 0. This e¢cient solution, however, may be inconsistent with utility maximization by each individual.

Which equilibrium—at 0, X or Y—will appear depends, among other things, on the relative negotiating power of a mother and her daughter and also on their altruism. Negotiating power, or the ability to extract the consumer surplus generated by the trade between a mother and her daughter, can depend on the order in which a mother and her daughter make their decisions, and on the opportunities for shirking.[2] One possible assumption is that the mother gets all the surplus or bene…ts. That is, the mother gives the bequest B only if the daughter devotes such e¤ort to services that makes the daughter indi¤erent about providing the service.

Suppose next that the mother is not sel…sh, but instead also cares for her daughter's utility. One way to allow for this is to suppose that the mother wants her daughter to enjoy a minimum level of utility, say u^{M}, which exceeds u^{X}. Such an indi¤erence curve is shown in Figure 1. The steady-state solution would then be at point M, where the indi¤erence curve intersects the 45^{o} line.

[2] These considerations are related to work on the Good Samaritan Paradox (see Bruce and Waldman (1990) and Lindbeck and Weibull (1988)). That literature assumes that the recipient shirks and thereby makes herself poorer.

We must yet check, however, that in such a steady-state solution no mother would demand greater services in return for the bequest. Thus, suppose that a mother had provided z_1^M in services to her own mother. She could demand more than z_1^M in services from her daughter, and enjoy higher utility. But this would reduce her daughter's utility, and because of altruism, the mother would not want to demand higher services. And she might not want to demand lower services, because she is not fully atlruistic.

Our analysis so far determined possible equilibrium values of z. But a given equilibrium can arise for di¤erent values of B; that is, the size of the bequest was irrelevant. The following section extends the model by considering an alternative use of assets a mother holds—consumption. A model with consumption is more realistic and also generates a unique equilibrium value for the bequest.

4 Bequests with consumption

Let each individual get utility from consuming a conventional good, x, when young. In addition, an individual when old gets utility from services provided by her daughter. The utility of a person born in year t is

$$U^t(z_1^t; z_2^t; x_2^t); \tag{2}$$

where $@U=@x_2^t > 0$.

A person born in year t gets a bequest B in year t + 1. She consumes x units of it in year t + 1, and invests B ¡ x. In one period this investment grows to (B ¡ x)(1 + r), where r is the market interest rate; she bequeaths this amount to her daughter.

Let the steady-state value of care or services be $z^¤$. Steady-state levels of B and x, $B^¤$ and $x^¤$, must satisfy $(B^¤ ¡ x^¤)(1 + r) = B^¤$, so that $x^¤ = rB^¤=(1 + r)$.

To characterize an equilibrium, note that maximizing utility requires a person's marginal utility from increased consumption to equal her marginal disutility from decreased services from her daughter, induced by the smaller bequest.

Consider a mother who increases her consumption by ¢. The increased

consumption directly increases her utility by

$$(@U^t=@x)(¢): \tag{3}$$

Her daughter's bequest is reduced by $¢(1 + r)$. Therefore (by the envelope theorem) the daughter's utility declines by $¢(1 + r)(@U^{t+1}=@x)$.

To maintain the daughter at the reservation utility level, the mother must reduce demand for services by

$$ds = ¢(1 + r)\frac{@U^{t+1}}{@x}=\frac{@U^{t+1}}{@z_1}: \tag{4}$$

The reduced services reduce the mother's utility by

$$ds\frac{@U^t}{@z_2}: \tag{5}$$

Equating (3) to (5) gives the condition

$$\frac{@z_2}{@z_1} = 1 + r: \tag{6}$$

We …nd, as we found in Section 3 above which considered no consumption good, that one possible equilibrium has bequests, services and consumption all equal zero: $(z^¤; z^¤; x^¤) = (0; 0; 0)$. Another possible equilibrium has positive bequests, services and consumption, but with no net gain as compared to the reservation utility $U(0; 0; 0)$ That is, each person's utility satis…es

$$U(z^¤; z^¤; rB^¤=(1 + r)) = U(0; 0; 0): \tag{7}$$

When individuals are altruistic, the steady-state could have utility exceed $U(0; 0; 0)$. As in our earlier discussion, in a steady-state each generation could enjoy the bundle $z_1^M; z_2^M; c_2^M$. Note also that in the absence of altruism, our model would predict that a mother would want her daughter to have a low opportunity cost of serving her mother, suggesting that parents may prefer that their children be uneducated. But if a mother shows some altruism, then she may favor education for her daughter, but not such a high level that her daughter would spend no time with her mother.

Lastly, analogously to point Y in Figure 1, another solution to consider is the one maximizing steady-state utility. But that need not result from individual maximizing behavior, even when individuals are altruistic.

We shall later want to compare discount rates used in evaluating public and private projects. For that purpose, we observe that a mother would be willing to pay $¢/(1+r)^2$ for an investment that will return $¢$ two periods in the future. That is, the usual rules for discounting apply for changed endowments (induced by bequests) across generations. To see this, consider a mother who bequeaths an investment. Then the asset allows the daughter to reduce her own direct bequest to the granddaughter by $¢/(1+r)$. In turn, the mother can reduce her direct bequest to her daughter by $¢/(1+r)^2$, which proves our claim.

5 Public investment that yields a consumption good

We now extend the utility function of the previous section to allow for the output of a public project, g. The utility of a selfish person born in year t is now

$$U^t(z_1^t, z_2^t, x_2^t, g_2^t); \tag{8}$$

where $@U/@g_1^t > 0$. The output of the public project is a consumption good, which is an imperfect substitute for the private consumption good x. We also assume that the daughter can only enjoy, but not bequeath, the output of the public project; the output lasts only for one period.

One might think that voters would always favor a public investment with a higher rate of return than the private investment it displaces. The conclusion is false, because individuals cannot fully control the allocation of goods provided by public projects. More concretely, and in terms of our model, a daughter who anticipates receiving much services from the public sector has a higher reservation utility, and is therefore willing to pay less in services to obtain a bequest from her mother with which she could purchase a private good. Or put differently, a mother can use a private good to buy services from her daughter, but cannot use a public good for that purpose.[3] When

[3] Bernheim, Shleifer, and Summers (1985) make related points. They note the absence of Ricardian equivalence when bequests are made to purchase services. They also note that social security benefits parents less than private bequests do. A similar distinction appears in our examination of public projects.

a public project yields a consumption good, rational voters may therefore support lower public investment than called for by a …rst-best solution. Of course, our result does not mean that voters will oppose all public projects, but instead implies that at the margin the strategic bequest motive may make a voter prefer a private investment over a somewhat more productive public project.[4]

To highlight the point, consider a public project with zero monetary costs for the current generation,[5] that generates output ¢ next period. This marginal public project leaves the mother's endowment unchanged, but increases her daughter's endowment by ¢. We shall consider a steady state without this public investment, and show that a person's utility may decline if government adopts a one-time public project that would bene…t her daughter. An alternative analysis can show that a steady state with public projects need not be an equilibrium: a mother in year t can increase her utility by voting against the project which bene…ts her daughter. The two analyses differ only in that one evaluates the mother's utility with no endowment from the public project, and the other evaluates the mother's utility starting from a point with the public endowment.

Let the steady-state solution with no public project have $z_1 = z_2 = z^{\alpha}$. A person can vote in year t for a public project that gives her daughter in year t + 1 an endowment of ¢.

The maximum utility of the mother is determined by the condition that her daughter is indi¤erent between (a) caring for her mother and receiving a bequest, and (b) not caring for her mother and not receiving a bequest:

$$U(z_1^{t+1}; z^{\alpha}; rB/(1 + r) + ¢) = U(0; 0; ¢): \tag{9}$$

The question is whether $z_1^{t+1} - z_2^t$ which satis…es this equation exceeds z^{α}. When $z_1^{t+1} > z^{\alpha}$ the mother's utility increases if

$$\frac{@U(z^{\alpha}; z^{\alpha}; rB^{\alpha}/(1 + r))}{@x} > \frac{@U(0; 0; 0)}{@x}: \tag{10}$$

[4] Our result corresponds to Kotliko¤ and Rosenthal's (1993) conclusion that the government in each generation may underprovide a durable public good. They consider how public investment may change asset values; they do not, however, consider the intergenerational transfers and services we do.

[5] The project may require spending this period. It may, however, be …nanced by borrowing from abroad in the current period, with repayment in the following period made from proceeds of the investment. This investment is thus costless to the current generation.

When this inequality holds, a sel…sh mother can increase her utility by demanding increased services, z_1^{t+1}, from her daughter who received ¢ in public bene…ts. When the inequality is reversed the mother su¤ers from the costless public investment.

Either condition may hold. Let care improve health. Private goods may be complements to good health: money is worth little to a person so ill she cannot enjoy it. In that case $@U(z^{¤}; z^{¤}; rB^{¤}=(1 + r))=@x$ can exceed $@U(0; 0; 0)=@x$. Parents would bene…t from the increased endowment that a public investment gives their children. But a sick person may plausibly have a high marginal utility of income. The inequality in (10) would be reversed: an increased endowment to children reduces the utility of the current generation of parents.

We summarize with

Proposition 1 A mother's utility may decline with her daughter's endowment.

The result has implications for the intertemporal discount rate to use in evaluating public projects. Consider an extension of our model which has a person live for four periods. In the …rst two periods she is a child; in the last two periods she is a mother. A person saves in the …rst period of motherhood to increase consumption in the second period. Consider a public investment made in the …rst period of motherhood which generates a return in the second period of motherhood. A utility-maximizing mother would favor such a project if the rate of return exceeds that on a private investment. In contrast, we saw that even a costless public investment which generates returns after a person's death may reduce that person's utility. (Of course, the gain may also be positive but small.) A rational person would therefore use di¤erent discount rates in evaluating a public project with returns during her lifetime and in evaluating a private project with returns after she dies.[6]

The rational bias against public projects is inconsistent with standard results showing that government should always accept projects with a rate of return higher than the market rate. Instead, in their notable work, Arrow and

[6] Glazer (1990) examines the e¤ects of public investments on the equilibrium interest rate. He shows that this e¤ect can make voters want government to use a discount rate di¤erent from the private rate of return.

Lind (1970) argue that government should use a discount rate lower than the market rate. Others claim that government uses inappropriately low discount rates because of the influence of special interest groups, or because legislators view construction costs as benefits to their constituents (Weingast, Shepsle, and Johnsen (1981)). Yet our result is consistent with evidence showing that the rate of return from investment in public infrastructure exceeds the return from private capital (see Aschauer (1989)).

Were the mother concerned only about her daughter's welfare, and were all individuals in all generations identical, then of course the mother would want to maximize her daughter's bequest, and so the mother would favor efficient public investments. And were the daughter altruistic towards her mother, say by wanting to assure herself a reservation level of utility, but otherwise devoting her efforts to her mother, then once again voters would favor efficient public investments.

But even with altruism in most (but not all) generations, a bias may appear against public investment. Suppose that in some generation a mother fears that with some probability her daughter will need much services from her granddaughter, more than her granddaughter would provide in the absence of an implicit payment through a bequest. Then the mother will want to leave a large private bequest so that her daughter could induce services from her own daughter.

6 Public investment in infrastructure

Consider next a public investment that does not directly produce a consumption good. Instead, the public investment, say in infrastructure, increases the rate of return on private investment. An individual's inability to control how the output from a public project is allocated then creates no problem because each parent still controls the benefits of the public project, that is the increased output of the private investments.

We again analyze the issues by supposing that the investment is free. Consider first a public investment in year $t + 1$ that increases the rate of return earned on the mother's investment in year $t + 1$, which becomes her daughter's bequest in year $t + 2$. The mother necessarily gains from this public project. To see this, suppose that the rate of return increases from

r to r + ±. A mother who wants to give the same bequest can increase her consumption of the private good by dx ´ B=(1 + r + ±) ¡ B=(1 + r). The mother's utility increases by [@U=@x]dx.

More interesting is a public investment made in year t that raises the rate of return on an investment made in year t + 1. Would a mother bene…t from an increase in the rate of return earned on the bequest made by her daughter to her granddaughter?

Let a public investment of g be made in year t. The rate of return on a private investment made in year t + 1 which generates bene…ts in year t + 2 is r(g), with $r^0 > 0$. To analyze the e¤ects of the public investment we use the following terminology. The person born in year t is the mother, the person born in year t + 1 is the daughter, and the person born in year t + 2 is the granddaughter. We ask whether, starting from a steady state without public investment, the mother can gain from an increase in the rate of return her daughter will earn.

The initial steady-state equilibrium (without public investment) had

$$U[z^{\alpha}; z^{\alpha}; r(0)B^{\alpha}=(1 + r(0))] = U(0; 0; 0): \tag{11}$$

Consider …rst a costless investment that increases by $r^0 dg$ the rate of return the daughter earns on the bequest she gives the granddaughter. The daughter can therefore increase her consumption of the private good by

$$\frac{d(B=(1 + r)}{dr} r^0 dg = \frac{B}{(1 + r)^2} r^0 \acute{} \ ¢: \tag{12}$$

The daughter's increased utility from consuming the private good is ¢@U=@x. The mother can then demand increased services from the daughter of $¡¢\frac{@U}{@x}=\frac{@U}{@z_1}$. The mother's utility thus increases by $¡¢\frac{@U}{@z_2} \ \frac{@U}{@x}=\frac{@U}{@z_1}$. The value of this expression is necessarily positive. This leads to

Proposition 2 A public investment which produces a substitute to a private good may reduce the mother's utility. But a (costless) public investment in infrastructure necessarily bene…ts the mother.

Now suppose the investment is costly, reducing the mother's endowment. The mother maximizes her utility by choosing the value of g satisfying the

…rst-order condition

$$¢\frac{@U}{@z_2}\tilde{A}\frac{@U}{@x}=\frac{@U}{@z_1}\;!\;=\frac{@U}{@x}; \tag{13}$$

so that

$$\frac{B}{(1+r(g))^2}r^{0}(g)=\frac{@z_2}{@z_1}: \tag{14}$$

In contrast, maximizing steady-state consumption of the consumption good requires maximizing

$$\frac{Br(g)}{1+r(g)}\;¡\;g: \tag{15}$$

Taking the derivative with respect to g gives the …rst-order condition

$$\frac{B}{[1+r(g)]^2}r^{0}(g)=1: \tag{16}$$

We saw from equation (6) that $@z_2=@z_1 = 1 + r$. Making this substitution in (14) and comparing to (15) shows that the conditions for maximizing steady-state consumption and for maximizing the mother's welfare di¤er. We have:

Proposition 3 A mother will invest too little in (costly) infrastructure.

7 Conclusion

Public …nance has considered important di¤erences between goods provided by government and goods owned by individuals: governmentally provided goods are often public goods, each person may be able to consume them at a price less than marginal social cost, and the level of provision is determined by collective decisions rather than by markets. This paper highlights an additional di¤erence: any one consumer lacks control over who will receive a governmentally-provided good. Sometimes this may not matter—a consumer may be indi¤erent to how much national defense others consume. But when one person's consumption opportunities a¤ect another's, this absence of control does matter. In particular, we saw that within a family an increase in a daughter's endowment may reduce the services she provides her mother. Such e¤ects can make an individual prefer private investments, whose output she controls, over a more productive public investment, whose output she does not control.

8 Notation

B Bequest

g Investment in infrastructure, which raises r

r Rate of return on private investment

U^t Utility of person born in year t

x_2^t Consumption of private good by person born in year t in period 2 of her life

z_1^t Services provided by person born in year t in period 1 of her life

z_2^t Services received by person born in year t in period 2 of her life

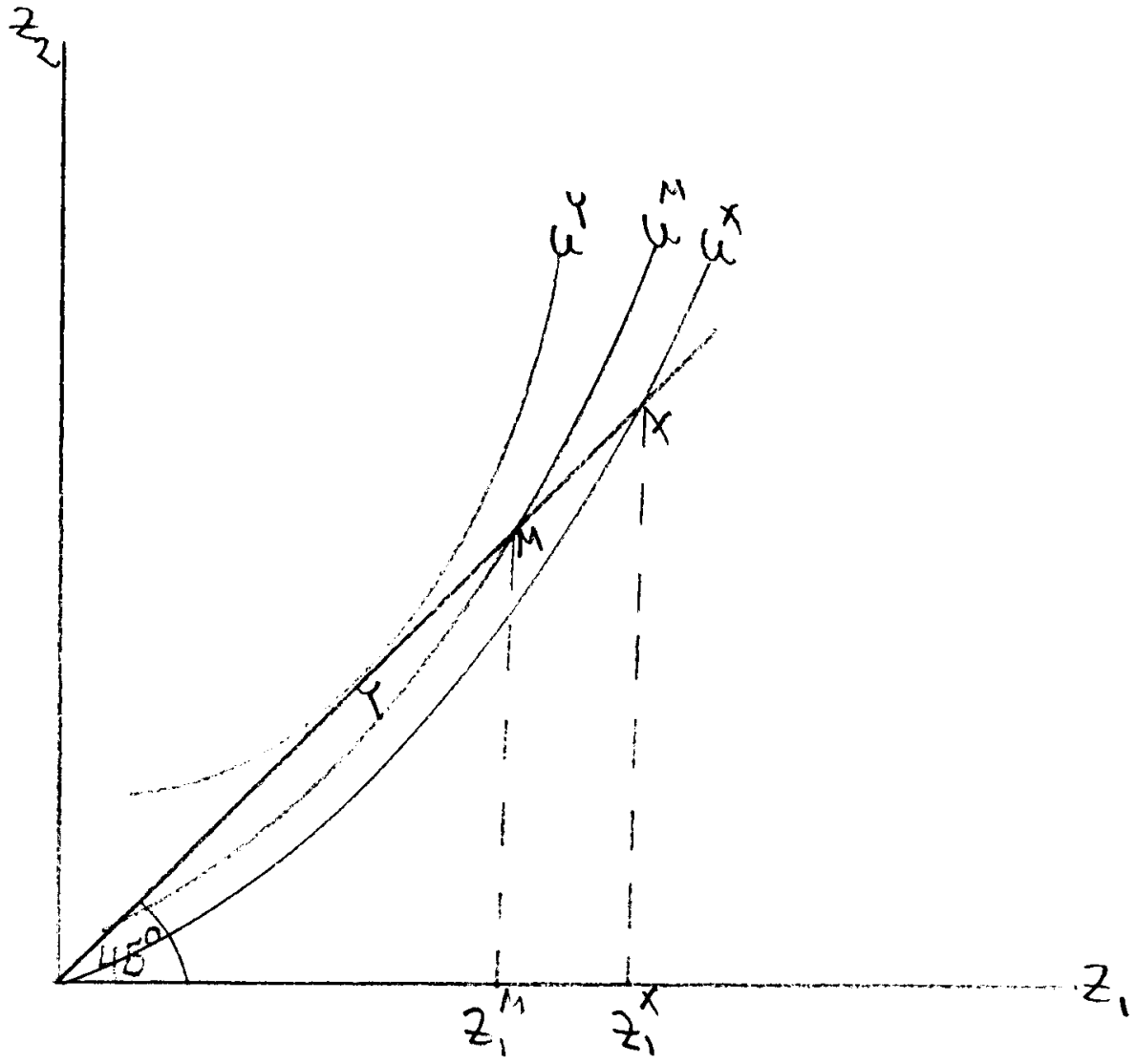

Figure 1

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