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Paid Basic Income, Fertility rates and Economic Growth

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Abstract: The purpose of this paper is to examine the effects of paid basic income on fertility rates in a model wherein fertility rates are endogenous. I show that when child labor is not a crucial part of a family's income, then paid basic income will lead to higher fertility rates. However, when child labor is a necessity, then in fact an increase in paid basic income will lead to a reduction in fertility rates.

JEL Codes: B10, D10, J13.
Keywords: basic income, fertility rates; economic growth; child labor; sibship size effect.

1. Introduction

Paid basic income is usually linked to welfare, consumption, and inequality. However, Endogenous Growth theory emphasizes that when a family's budget constraints are affected by changes in exogenous variables, an essential element with long-run effects is affected: fertility rates. The purpose of this paper is to examine the effects of paid basic income on fertility rates in a model wherein fertility rates are endogenous.

Fertility rates and paid basic income were studied at length by Malthus, who claimed that the Poor Law, one of the first instances of paid basic income, would lead to higher fertility rates. Since then, the subject of fertility rates has been analyzed at length, especially during the past decades, mostly in a Beckerian framework wherein parents take into

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consideration not only their own utility of consumption, but also their children's consumption.

More specifically, from Becker onwards, fertility rates have been perceived as a choice by parents, involving on one hand, a budget constraint, and on the other hand, a utility function. Our model will incorporate into the budget constraint that children can work, so that parents receive satisfaction as consumers from having children and benefit as producers from children's labor.

Table 1: Earnings and cost of living for one worker couple in Bath for the years 1832-1850.

	Earnings	**Cost of living**
Bath (England)	(shillings per week)	
1832	9s 6d	13s 1d
1840	13s 2d	13s 10d
1850	14s 1d	14s 2d

Source: Neale (1975).
Note: For Bath it is assumed that subsistence for one worker couple includes 28.5lb of bread, 1.5 lb of meat, 1lb of bacon, 3lb of cheese, and 4lb of potatoes. The cost of this basket for 1832 was 9s6d. Adding to it 1s4d for clothing and shoes, 3d for candles and soap, 6d for fuel, and 1s6d for rent, for a total cost of 13s1d.

While it is quite obvious that child labor is not an essential element in the family budget in developed countries, for many families in poor countries, it is a crucial element in the budget. It is interesting to note that, as shown in Table 1, earnings of the poor class in early 19th-century Europe (at the time of Thomas Paine) was not enough to provide minimal subsistence consumption. The gap between income and subsistence consumption was bridged by income generated by child labor, so that child labor was non-negligible in the 19th century, as it is in non-developed countries today. In consequence, this paper examines the effects of paid basic income in two types of models: those wherein child labor is a necessity, and those wherein it is not.

I will show that in these two differing models, an increase in paid basic income has an inverse effect on fertility rates. I show that when child labor is providing income to a family, an increase in paid basic income will lead to a reduction in fertility rates; while in a model wherein child labor is not significant, we get the opposite effect: An increase in paid basic income will lead to an increase in fertility rates.

This contrasting effect of paid basic income on fertility rates is found in the early literature on the Poor Law. On the one hand, Malthus claimed that the Poor Law would have negative effects on the economy. He argued that population growth caused by high fertility erodes worker welfare productivity, and thus social policy that results in higher fertility, such as the English Poor Law, contributes to overpopulation. On the other hand, some mercantilists claimed that the Poor Law would affect neither child labor nor fertility rates, and could even lead to a decrease in fertility rates.

Why were there divergent views on this relationship? This paper will show that these diverging positions on the effect of paid basic income on fertility rates are in fact related to two other subjects: child labor and the sibship size effect.[1]

In this paper, I show that when child labor is a necessity for survival, (and there is a sibship size effect), then an increase in paid basic income will reduce fertility rates. However, when child labor is not a necessity, then increasing basic income will increase fertility rates.

Before explaining how these differing positions are related, we should explain what the sibship size effect entails. In the next section, we present explanations on sibship size effect, data on child labor, and earlier views on paid basic income, first implemented in England as the Poor Law. In Section III, we present the model, and Section IV concludes.

2. Poor Law, Child Labor and the Sibship Size Effect

2.1 Paid Basic Income in England: The Poor Law[2]

The Old Poor Law was the system of local public assistance that existed in England and Wales from 1597 until 1834, and was amended in 1834 to remain in existence until the 20^{th} century. The Poor Law provided an important safety net for labouring households that were unable to protect themselves against income loss.

It was adopted in response to a sharp deterioration in workers' living standards in the 16th century, combined with a decline in traditional forms of charitable assistance. Indeed, the dissolution of the monasteries, religious guilds, almshouses, and hospitals under Henry VIII had eliminated many of the traditional sources of charity for the poor. The Old Poor Law constituted

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[1] The sibship size effect analyzes the outcomes of number of siblings on a child's health and intellectual development. We discuss the sibship size effect in the next section.

[2] This part is based on Boyer (1990, 2008).

'a welfare state in miniature', relieving the elderly, widows, children, the sick, the disabled, and the unemployed (Blaug, 1964).

However, the 18th century witnessed an explosion in relief expenditures: Relief expenditures increased from 0.8 per cent of GDP in 1696 to a peak of 2.7 per cent of GDP in 1818–20, and then remained at this high level until the Poor Law was amended in 1834. It is interesting to note that the share of paupers aged 20–59 increased significantly, and the share "aged 60 and over" declined.

When comparing England to other countries, from 1795 to 1834, relief expenditures as a share of national product were significantly higher in England than on the European continent. However, differences in spending between England and the continent were relatively small before 1795 and after 1834 (Lindert, 1998).

The sharp increase in relief spending after 1780 sparked a major debate on the Poor Laws. Most participants in the debate were critical of the granting of outdoor relief to able-bodied males, on the grounds that such aid created serious work disincentives.

Among the sharpest critics was Thomas Malthus, who argued in An Essay on the Principle of Population (1798: 40) that the Poor Laws, by guaranteeing parish assistance to able-bodied labourers, 'diminish both the power and the will to save among the common people, and thus . . . weaken one of the strongest incentives to sobriety and industry, and consequently to happiness'.

The views of Malthus were not only related to labor supply and output, but also to population. He claimed that:

> The poor laws of England tend to depress the general conditions of the poor…Their first tendency is to increase population without increasing the food for its support. A poor man may marry with little or no prospect of being able to support a family … [Morevoer] the evil is perhaps gone too far to be remedied, but I feel little doubt in my own mind that if the Poor Laws had never existed…the aggregate mass of happiness among the common people would have been much greater than it is at present. (Malthus, 1798: 97, 101).

In conclusion, for Malthus, the Poor Law led to an increase in population, and to the poor staying poor. However not all scholars agreed with Malthus, and some emphasized that a decrease in income can lead to an increase in population.

Indeed, Marx wrote that the relationship between the size of the family and the level of real wages can be the inverse of that denoted by Malthus. Marx claimed that family size is inversely related to real wages. As he wrote, "In fact…the absolute size of the families stands in inverse proportion to the height of wages … Misery up to the extreme point of famine and pestilence, instead of checking, tends to increase population" (Marx, 1976: 796-7).

Marx also claimed that consumption and fertility rates are related to the dependence of all on the family's wage labor. Indeed, "Individual workers, millions of workers do not get enough to be able to exist and reproduce themselves" (Marx, 1978: 206).

In consequence, there is a need for the work of children in order to ensure the family's survival: "All family ties among the proletarians are torn asunder, and their children transformed into simple articles of commerce and instruments of labour" (Marx and Engels, 1955: 28). Moreover as expressed by Marx:

> "In order that the family may live, four people must now not only labour, but expend surplus labor for the capitalist…Previously, the workman sold his own labor power, which he disposed of nominally as a free agent. Now he sells wife and child. He has become a slave dealer" (Marx, 1976: 395).

So Marx emphasized that the increase in fertility rates among the workers is due to a reduction of wages, since the family needs income generated by child labor, even if this leads to more diseases and an overall drop in the quality of life.

In conclusion, some as Malthus thought that Paid basic income (PBI) in the form of Poor Law leads to an increase in population, while Marx thought that an increase in income will lead to having fewer children.[3]

In the next section, we present a model in which paid basic income does not always lead to an increase in fertility rates. We will show that in some cases, Malthus is right and an increase in PBI leads to an increase in population, but in some other cases, Marx is correct, i.e., an increase in PBI leads to a decrease in fertility rates. The element which is essential for the sign of the relationship between PBI and fertility rates is the sibship size effect, we present now.

2.2 The Sibship Size Effect

The term "sibship size" was coined by the medical literature in order to describe the effects of the size of the family on the well-being of the members of the family. In contrast to the standard economic model on

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[3] In other words, having less proletarii, when proletarii means: "the one who produces offspring." See also Brezis and Young (2003).

population which introduces the number of children as a *positive* variable in the utility function, this literature has emphasized the *negative* effects of family size on the health of the family.

The medical literature points out "the negative consequences for health due to crowding and greater exposure to diseases, such as measles, chicken pox and diarrhea" (Desai, 1995: 198). Aaby (1988) and Aaby et al. (1984) have shown that in poor countries the addition of a sibling aged less than five years has a statistically negative impact on the child's height-for-age, which is a good proxy for children's overall health. Moreover, larger families appear "to increase the child's risk of contracting the infection and the severity of the infection among those who do become ill" (Desai, 1995: 198). Thus, larger families appear to induce adverse long run effects on health.

Another reason for such negative effects is mothers' sickness, indirectly hindering the development of children. Recent research has shown that ultra-orthodox Jewish women in Israel, England and the US, who have on average more than seven children, are more often sick, and cannot take care of their children as well as healthy women (Taha et al., 2001; Strauss, 2007; Wright et al., 2010).

Independently of this particular source of educational deficiency, a negative influence of family size on the emotive and intellectual development of the children has been pointed out by the psychological and sociological literature. This literature emphasizes the negative effects of family size on the formation of the sibling's human capital, and more specifically on the level attained once the sibling has become an adult.

The first direct effect is analyzed by the "resource dilution theory," which claims that sibship size dilutes family resources, especially psychological and emotional ones, negatively affecting the intellectual growth of children.[4] Guo and VanWey (1999) show that an increasing number of siblings lowers intellectual performance. They do so by testing the effects of sibship size on cognitive abilities of children, and show that increasing the number of siblings lowers intellectual performance on reading achievement and mathematics tests. The literature also stresses that there are scale diseconomies in housekeeping, so that the time left for education is a decreasing function of sibship size.

To conclude, while the standard theory of the family does not introduce a negative effect of the number of children on the well-being of the family, the medical and sociological literature does introduce it, and shows that the

[4] On the effects of sibship size in terms of the resource dilution theory, see Guo and VanWey (1999), Downey et al. (1999), King (1987), and also Phillips (1999).

sibship size effect appears when children in large families are, ceteris paribus, less healthy and less developed intellectually.

2.3 Child Labor in the Past and Present

Child labor in the nineteenth century amounted to a significant part of the workforce in some British industries. In the 1830s, in some regions such as Lancashire and Leeds, 36% of the workforce in the textile industry consisted of children under age 16, and in all England, children under 12 years of age constituted 8% of the labor force in the cotton industry, while children age 13-18 another 10%.[5]

Child labor was needed in periods in which the salary of one person was not adequate for subsistence. Hence, children brought about an increase in the family income. Indeed, during the nineteenth century, the share of male factory workers' earnings in the family income went down from 60% in 1800 to 55% in 1820, 42% in 1825 reaching 39% in 1835. This was the period in which wages decreased and fertility rates increased.[6] Therefore men's relative contribution fell suggesting the necessity of getting other households members into the labor force. As emphasized by Horrell and Humphries (1997: 35-42):

> "The contributions of women and children may *have been crucial* to most families during certain stages in the family life cycle … In only a few occupations were men earning enough to buy their families sustenance and to provide the roof over their heads; for most households the earnings of women and children were essential."

About data on earnings and spending of families in 19th-century England, we find that the comparison of earnings and spending of poor families in the 19th century shows that the earnings of a working couple did not enable subsistence levels. Indeed, the earnings of a working couple in Bath were lower than their cost of living (see Table 1).[7]

What with poor countries nowadays? The evidence can be summarized as follows:[8] First, child labor in poor countries, and especially in Africa

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[5] See Evans (1990), and Tuttle and Wegge (2002).

[6] See Horrell and Humphries (1995, 1997). Although it should be noted that in the second half of the nineteenth century, this share increased back to 69% in 1865, a time at which real wages increased, and fertility rates decreased.

[7] Not surprisingly, data gathered on workers in Lille (France) display this same pattern (see Brezis, 2001).

[8] The data on child labor nowadays is mainly based on the Penn World series and on reports by Unicef and the ILO on child labor; it is also based on Edmonds (2008).

constitutes a large part of the workforce. Second, child labor has considerable negative effects on children's health and their capacity to work as adults. Third, some poor families need child labor in order to survive.

The ILO reports (2006) estimate the prevalence of child labor at 250 million in developing countries, and indicate that 120 million are full time workers of which 80% are between the ages of 10 and 14 years old. The number of hours spent working in some of the poor countries by children is quite considerable. It is striking that in some of the countries, such as Ethiopia and Mali, the number of hours worked by children, age 5-14, is above the maximum 35 hours of France for adults.

The importance of child income in alleviating household poverty varies over countries. In most countries, the percent of families who would see at least a reduction of living standard is higher than 60%. But many families claim that without child labor, the household enterprise would stop operating, which would send the family to poverty. And even worse, some families claim even that they could not afford living without child labor.

Okpukpara and Odurukwe (2006: 23) even note that: "Many families have no alternative other than to send their children to work because they see their earnings as an input into family survival." Edmonds and Pavcnik (2005: 210, fig.1) show that there is a strong negative correlation between living standard and child labor. In the same line of research, the ILO survey (2006: Table 20) brings about the association between child activity options and household poverty status. They show that only poor families send their children to work despite the negative effect it will have on their health. In some areas of Nigeria, the child's income is some 30% of total household income.

In conclusion, this section has shown that in some poor countries, child labor is a significant part of the labor supply, and that in big families, there can be a sibship size effect. We now turn to explain how these different elements are related to Paid basic income.

3. Models of Family, Child Labor and Fertility with Paid Basic Income

In this section we will develop two different frameworks based on the Beckerian model of fertility rates. The main difference between these two frames is that in the first one, child labor is either non-existent or negligible. In the second frame, we assume that child labor is necessary for the family, and net income from child labor is positive. Moreover, we introduce a

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The ILO's statistical Information and Monitoring Program on Child Labor (SIMPOC) is the organization charged with analyzing child labor around the world. The data is based on questionnaires sent to families in each of the various countries.

sibship size effect. This difference in assumption affects the relationship between paid basic income and fertility rates. We show that in the first frame, an increase in paid basic income will lead to an increase in fertility rates, while in the second one, in which child labor is a necessity, then an increase in paid basic income leads to decrease fertility rates. We start by presenting the basic assumptions which are common to both frames, and then we present each frame separately.

3.1 The Basic Model

The model is a regular Beckerian model and the framework of the model is dynamic in the sense that there is a continuity of generations; each generation of individuals lives two periods: first as children and second as adults. When agents are adults, they work, consume, and have children which work so that parents receive a net income from the children, which can be either positive (as in section 3.3), or negative (as in the next section, 3.2).

In the first period of life, agents are children who first live with their parents, work, and consume. Then, in the next period they get their own income, and also receive a paid basic income, BI.

The utility function of the parent, W_p, is a function of its own consumption, C_p, and the utility function of each child, *W*.

$$W_p = U(C_p) + n\delta W(C_c) \,. \tag{1}$$

where *U* and *W* are both twice continuously differentiable, strictly increasing and strictly concave. $\delta < 1$ is a parameter measuring the extent to which parents are altruistic, and *n* is the number of children. The budget constraint of the parent is:

$$C_p = A + BI + nwl_c - \sigma n \,. \tag{2}$$

where A is the income earned by the parents; BI the paid basic income; σ is the cost per child; *w* are the wages earned by children; and l_c is the fraction of time children are working. The term $n[wl_c - \sigma]$ is the net income generated by children, and which can be either positive or negative.

The consumption of children in the next period, which is financed by his income when adult is:

$$C_c = wH \,, \tag{3}$$

where *H* is the human capital obtained by the child at adulthood, and the wage *w* is the expected future wage per efficiency unit of labor.

From equation (1) to (3), we get that the utility function of the parent is:

$$W_p = U(A + BI + nwl_c - \sigma n) + n\delta W(wH)\ . \tag{4}$$

The difference between both frames will focus on the form of the human capital *H*. In the family economics literature, and following Becker, human capital, *H* is an increasing function of the time devoted to education. Denoting $l_c \in [0,1]$ as the fraction of each child's time to be allocated to work, and assuming that the total amount of time is 1, we obtain that the time devoted to education is equal to $1 - l_c$, and therefore human capital *H* is a decreasing function of the time devoted to work, l_c.

In the version presented in section 3.2, we stick to that regular form, and H is only function of time devoted to work. So:

$$H = H(l_c) = h(1 - l_c) \tag{5}$$

But in section 3.3, we introduce a sibship size effect. The size of the family, *n* negatively affects the human capital of children, as explained above. So, the amount of human capital takes the form:

$$H = H(l_c, n), \qquad H_l < 0, H_n < 0, H_{ll} \leq 0, H_{nn} \leq 0.$$

Function H is assumed to be a twice continuously differentiable function of the time l_c allocated to work and of the family size *n*.

3.2 Population and Basic Income in a Beckerian Model without Sibship Size Effect

In this frame, we assume that a sibship size effect does not affect human capital, and therefore we assume that human capital takes the form in equation (6):

$$H = H(l_c, n) = H(l_c) = h(1 - l_c) \tag{6}$$

In consequence, we have that the budget constraint of the child, when being adult is:

$$C_c = wh(1-l_c) \qquad h' > 0 \quad and\ h'' < 0\,. \tag{7}$$

We assume that the function h is twice continuously differentiable, strictly increasing and strictly concave and $h(0)=1$. Parents have to choose the amount of children, n and the amount of child labor, l_c, which maximize the utility function in equation (8):

$$W_p = U(A + BI + nwl_c - \sigma n) + n\delta W(wh(1-l_c))\,. \tag{8}$$

The two first-order conditions with respect to l_c and n are respectively:

$$U'(C_p) = \delta W'(C_c)h' \tag{9}$$

and

$$U'(C_p)[\sigma - wl_c] = \delta W(C_c)\,. \tag{10}$$

From equation (10), it is obvious that in order to get an interior optimum for the number of children, it is necessary that:

$$[\sigma - wl_c] > 0\,. \tag{11}$$

So when one does not assume that a sibship size effect exists, one needs also to assume that even if children work, they bring a negligible amount of income, compared to their own expenditures, which is exactly what we have assumed. Either children do not work or if they work, they still do not earn enough to pay for their own expenditures.

How an increase in basic income affects the hours worked of the child, and how does it affect the fertility rates? We will show that in this version of the model, an increase in received income leads to increase fertility rates

Proposition 1: Under the conditions of this model, in which H is not a function of *n*, and $[\sigma - wl_c] > 0$ then, we get:

$$dn^*/dBI > 0 \tag{12}$$

$$dl_c/dBI = 0\,.$$

Proof: The proof is in appendix A.

This proposition means that increasing paid basic income will lead to an increase in fertility rates. This is exactly what Malthus claimed when he was strongly opposed to the Poor Law. He claimed that the poor will have more poor children, and that the Poor Law by itself will not alleviate poverty.

It is interesting to note that in this model, the increase in basic income does not lead children to invest more in their human capital, and thus to get higher income in the future. They will therefore stay poor as they parents.

We now turn to the second version of a Beckerian model, in which child labor is a necessity for the family, and in which we introduce the sibship size effect.

3.3 Population and Basic Income in a Model with a Sibship Size Effect

In this section, child labor is a necessity for the family and is such that:

$$[wl_c - \sigma] > 0\,. \tag{13}$$

In other words, children are bringing a positive income to the family, and intergenerational transfers are from children to parents. The question to be asked is whether in this frame, the results presented in equation (12) holds. As we will show, the answer is no: We get the opposite result.

First, we should emphasize that when equation (13) holds, we cannot use the simple utility function of equation (5), since we do not have an interior solution to the first-order condition expressed in equation (10). This is the reason we introduce the sibship size effect which is included in equation (14):

$$H = H(l_c, n),$$

$$\text{and} \quad H_l < 0, H_n < 0, H_{ll} \leq 0, H_{nn} \leq 0. \tag{14}$$

The underlying reason beneath this sibship size effect has been presented in section 2, in which we have emphasized that many siblings affect the human capital of the child in the future.

To simplify notation, we denote:

$$V(l_c, n) = W(wH(l_c, n))$$

The parent’s decisions concern the fraction l_c of each child's time to be allocated to work, and the desired number *n* of children which maximize the utility function, such that the two first-order conditions for interior solutions in l_c and n can respectively be written as:

$$U'(C_p)w = -\delta V_l'(l,n) \tag{15}$$

and

$$U'(C_p)\left(\sigma - wl\right) = \delta\left(V(l,n) + nV_n'(l,n)\right). \tag{16}$$

It is easy to see that equation (13), that is, $[wl_c - \sigma] > 0$, is a condition necessary to get an interior optimum for the number of children, *n* (equation 16). This condition is opposite to the one presented in the previous model (equation 11), and as we showed in section 2, it is consistent with the situation found in some countries.

The reason for obtaining inverse conditions can be explained intuitively. In the previous framework, which correspond to social behavior in rich countries, an increase in the number of children leads to higher utility through the utility of children, but reduces utility through its own consumption (net income from children is negative). In this framework, an increase in the number of children leads to higher utility through its own consumption, but decreases the utility through the utility of children due to the effect on health deterioration.

In the previous framework, we have shown that an increase in paid basic income leads to an increase in the number of children. What will be the relationship in this new framework? In the following proposition, we show:

Proposition 2: Under the conditions of this model, in which H is a negative function of n, and $[wl_c - \sigma] > 0$ then, we get:

$$dn^* / dBI < 0 \tag{17}$$

$$dl_c / dBI = 0.$$

Proof: See Appendix B.

This proposition means that, in opposite to the previous framework, an increase in paid basic income leads to a reduction in the size of the family. The intuition for that result is that when basic income increases, the parents are less dependent on the net income of their children and on their work. Therefore, they will reduce their fertility rates. However, as in the previous version of the model, the amount of paid basic income does not affect investment in education.

In the next section, we check a calibration of both frameworks and will show that paid basic income affects fertility rates with inverse sign in both cases.

3.4 Calibration of the two frameworks

By calibrating the model, I will show that, in the first version, we get that an increase in paid basic income leads to an increase in fertility rates, and that in the second version we get the opposite. We check the effects of a change in basic income for three different scenarios, i.e., BI = 10, 20, 40.

Let us remember that the utility function is:

$$W_p = U(C_p) + n\delta W(C_c) \,. \tag{1}$$

We assume that both *U* and *W* are of CRRA form with constant elasticity:

$$U(C_p) = C_p^{\gamma} \quad and \quad W(C_c) = C_c^{\beta} \tag{18}$$

Let us check the frame without a sibship size effect.

3.4.1. The first framework

In this case, we have defined the child consumption as:

$$C_c = w\,h(1-l_c) \qquad h' > 0 \quad and \; h'' < 0 \,.$$

So the utility function, as shown in equation (8) is:

$$W_p = U(A + BI + nwl_c - \sigma n) + n\delta W(wh(1-l_c)) \,.$$

We assume that h takes the form of a log function:

$$C_c = w\,h(1-l_c) = w\ln(\rho(1-l_c) \,. \tag{19}$$

Table 2 depicts the parameters assumed in this exercise.

A	w	γ	β	δ	σ	ρ
30	4	0.8	0.9	0.6	8	6

Table 2. Parameters and values common to the three scenarios

The endogenous variables are fertility rates and child labor. Remember that in this first frame, equation (11) has to hold, that is, $[\sigma - wl_c] > 0$.

The results are shown in Table 3. We find the endogenous variables for three values of Paid basic income.

	n	l_c
BI = 10	2.56	0
BI = 20	3.78	0
BI = 40	6.32	0

Table 3. The three scenarios

So the results corroborate Proposition 1. We now turn to the case with a sibship size effect.

3.4.2. The second framework

In this case, the child's human capital is a negative function of both labor and number of siblings, and for matter of simplicity, we assume:

$$H = H_0 - \lambda n l_c^2 . \tag{20}$$

where H_0 and λ are two exogenous parameters. So the utility function is:

$$W_p = U(A + BI + nwl_c - \sigma n) + n\delta W(w\ (H_0 - \lambda n l_c^2)) . \tag{21}$$

Table 4 depicts the parameters assumed in this exercise.

A	w	γ	β	δ	σ	H_0	λ
30	12	0.8	0.9	0.6	10	0.5	0.054

Table 4. Parameters and values common to the three scenarios

The endogenous variables are fertility rates and child labor. Remember that in this second frame, equation (13) has to hold, i.e., $[wl_c - \sigma] > 0$; and indeed it holds.

The results are shown in Table 5. We find the endogenous variables for three values of Paid basic income.

	n	l_c
BI = 10	5.92	1
BI = 20	5.88	1
BI = 40	5.80	1

Table 5. The three scenarios

So the results corroborate Proposition 2. Indeed, in a frame with a sibship size effect, we get that when paid basic income, fertility rates are reduced; although with the parameters chosen, the reduction is small, yet it is still a negative effect.

4. Conclusion

The debate on the effects of paid basic income on the economy is not new. When the Poor Law was enacted in 1597 in England, there was fierce debate over whether a compulsory system of poor relief is beneficial to society. The debate on paid basic income is usually related to welfare and incentives to work, and also its effect on wages and unemployment.

This paper takes a different angle, focusing on the effects of paid basic income on fertility rates. As early as the time of the enactment of the Poor Law, some mercantilists claimed that the Poor Law would not only lead the poor to be idle, but that they would consequently have more children. On the other hand, other mercantilists claimed that the poor would be less dependent on the income of children, and this could in fact reduce family size and numbers of hours worked.

In this paper, I show that none of them are correct, and none of them are wrong: It depends on the form of the utility and also whether children's labor is a necessity. I show that, indeed, when child labor is not a crucial part of the family income, then a paid basic income will lead to higher fertility rates. However, when child labor is a necessity, then in fact an increase in paid basic income will lead to a reduction in fertility rates.

This approach, that relates paid basic income to questions external to the labor market, is interesting as it leads to broadening the debate and showing that basic income might also affect social decisions related to family size, which in turn affects economic growth, through a Solovian model.

A priori, basic income should also affect the number of hours children work. Yet in our simple model, we show that this is not the case. In fact, basic income does not affect the number of hours and the amount of human capital the child generates; it affects number of children only.

In conclusion, paid basic income not only affects consumption, output, and the labor market; it also affects fertility rates. However, it is not clear whether paid basic income leads to bigger families or to smaller ones. This paper has shown that it depends on assumptions underlying child labor and whether negative sibship size effect is incorporated into the utility function.

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Appendix A

The proof takes the following form: Since *n* is not an argument in equations (9) and (10), then they completely determine the sole unknown l_c, independently of the basic income *BI*. Hence, $\partial l_c / \partial BI = 0$ and, given l_c, the parent's consumption C_p is determined by any one of conditions (9) or (10), also independently of *BI*. Finally, by equation (2) and since $\sigma - wl > 0$, *n* and *A* must move in the same direction.

Appendix B

Let us assume a sibship size effect taking the following form:

$$H(l_c, n) = h(1 - l_c)n^{-\alpha} \qquad \alpha > 0 \tag{B1}$$

and the function *h* is such that h'>0 and h"<0 (exactly as in the previous frame).

We further assume that the child's utility function *W* is of class CRRA, with constant elasticity β thus satisfying, $0 < \beta < 1 < \alpha\beta$. So:

$$W(C_c) = C_c^{\beta} \tag{B2}$$

Notice that from the specific forms assumed in (B1) and (B2), we thus obtain by the chain rule $\varepsilon_{V,n} = -\alpha\beta < -1$.

It is easy to show that the child's labor l_c is independent of the basic income BI, so

$\partial l_c / \partial BI = 0$.

Taking the total derivative of the FOC relative to *n*, we then get by strict concavity of U'' and W_p :

$$\frac{\partial n}{\partial BI} = -\frac{\partial^2 W_p / \partial BI \partial n}{\partial^2 W_p / \partial n^2} = \frac{(wl - \sigma)U''}{-\partial^2 W_p / \partial n^2} < 0 \tag{B3}$$

In the calibration, we use another form of function for H, which is simpler to calculate. We assume that:

$$H = H_0 - \lambda n l_c^2 \text{; and } H_l < 0, H_n < 0, H_{ll} \leq 0, H_{nn} \leq 0. \tag{B4}$$