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the cultural role of agriculture in economic development

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Rural-urban migration and endogenous ethic: the cultural role of agriculture in economic development

by

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Abstract

This paper argues that, in a developing economy, progress in agriculture may stimulate growth of the urban sector through important non-market-mediated effects. Higher living standards enable traditional agricultural societies to solve their social dilemmas, which implies a stream of civic-minded rural-urban migrants that improves the social-capital base for non-farm growth. Unfavourable conditions in agriculture, however, can lead to a cultural poverty trap that hampers the structural transformation of a traditional economy. We examine this argument using a Harris-Todaro type of economy with efficiency wage setting in the urban sector.

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1 Introduction

Five decades ago, Johnston and Mellor (1961) asked themselves why modern growth almost always started with an economic revolution in agriculture. They surmised that the latter involved vital linkage effects that stimulated the rise of modern industries and service sectors. Agricultural development created opportunities for upstream and downstream activities, and provided the savings, labour, and wage goods that successful industrialization required. Subsequent research highlighted the effect of agricultural growth on the rural markets for non-tradable non-agricultural products (e.g., Hazell and Roell, 1983; Delgado et al., 1993; Block and Timmer, 1994). This was in line with studies on trade and development that pointed to the importance of domestic demand in early growth phases (e.g., Balassa, 1978; Heller and Porter, 1978; Urata, 1989). After 1980, however, the idea that, thanks to 'globalization', the initial push could also come from export demand, became popular. The corollary was that agriculture would no longer be needed as an initiator of economic development, since any sector in which a country had a comparative advantage would be able to fulfil this role. However, this expectation was not borne out by experience (Timmer, 1988). The economic miracles in Asia once more started with accelerated growth in agriculture. Moreover, where agriculture was stagnating (mainly in Sub-Saharan Africa) the non-farm economy was also sluggish. To explain why, in a globalized world, agriculture nevertheless remained important as an initiator of development, Timmer (1995) suggested that farm progress entailed vital non-market-mediated effects that stimulated non-farm development. Timmer himself pointed to managerial skills. In this paper, we suggest that economic ethic may similarly be important.

Our argument can be sketched as follows. In traditional societies, generalized reciprocity norms and generalized trust are underdeveloped. People confide in kin and quasi-kin, but transactions with outsiders are complicated by moral hazard (see, e.g., Platteau, 2000; Hoff and Sen, 2006). As a consequence, economic modernization, which involves a broadening of transactions, runs up against a social dilemma. The impact of this is likely to differ across sectors. In the relative anonymity of the formal urban sector, the dilemma is difficult to solve. This is a problem, since the industrial and commercial enterprises in this sector are especially vulnerable to its effects. As Adam Smith already observed, non-farm businesses are especially sensitive to opportunistic behaviour because they have constantly to deal with outsiders. In comparison, smallholder farmers interact with outsiders only a few times per year: when they accept credit, buy inputs, hire labour in the peak season, and sell their crop. Several of these dealings may be interlocking transactions with the same actor; for example, the buyer of the crop who also provides inputs on credit. In addition, reputation mechanisms are more effective in rural communities than in the more anonymous urban economy. In other words, the social dilemma has

more chance to be overcome in the rural sector than in the urban sector. This complies with data in Fafchamps' (2004) study that suggest that agricultural traders in Africa experience fewer problems of contractual non-performance than manufacturers.

In the rural communities, our argument continues, the social dilemma can be surmounted if there are sufficient individuals with a universalistic ethic whose sanctioning induces others to comply with generalized reciprocity norms. In this case, a virtuous cycle may follow of successful cooperation that, over time, enhances the universalistic predisposition among the rural population (see, e.g., Ostrom, 1998). This evolution has a significant external effect on the urban economy because, in the first phases of the economy's structural transformation, the urban labour force consists for a large part of rural-urban migrants. A stream of civic-minded rural-urban migrants improves the quality of the urban labour force and thus sets the stage for nationwide economic growth.

The idea that progress in agriculture may stimulate growth of the urban sector through cultural effects is an old one. In western countries around 1900, many authors were praising the moral virtues of farmers, and the healthy effect that rural-urban migration would have on urban economic cultures (Koning, 1994). Much of this agrarian fundamentalist literature was overly romantic. Nevertheless, many scientists are convinced that rural migrants contributed significantly to the social-capital base for non-farm growth. This western experience contrasts with observations that in present Sub-Saharan Africa, rural crisis is engendering clientelism, social exclusion, witch paranoia, and civil war (e.g., André and Platteau, 1999; Miguel, 2005; Patterson, 1998; Peters, 2006; Woods, 2003). These accounts suggest that lack of progress in agriculture is an important cause of the social-capital deficiencies that hamper economic development in this region (e.g., Collier and Gunning, 1999). The rural problems have been depicted as typically African – as pathologies stemming from the region's peculiar history and culture (e.g., Bayart, 1989; Bayart et al., 1999). It should be remembered, however, that the history of other regions also includes periods of widespread cultural and political crisis. With regard to Europe, we have only to think of the tumultuous 14th century, with its Hundred Years War and persecution of the Jews, or the decades around 1600, with their devastating religious wars and the witch-hunt. Indeed, social stability in medieval and early-modern Europe was not self-evident. As Philip Hoffman highlighted in his study of Ancien Régime France, rural societies had a pervasive problem of moral hazard. The 'moral economy' of rural communities was a precarious cooperative solution for this problem – a cooperative Nash equilibrium that could all too easily give way to a non-cooperative equilibrium (Hoffman, 1996).

In this paper, we identify conditions that may tip the rural-cultural balance from one side to the other, and study the implications for modern development. Our point of departure is a Harris-Todaro type of economy with efficiency wage setting in the urban sector and an endogenous social-capital base in the rural sector. We show that if a civic ethic is shared among only few rural-born, a migration equilibrium exists with minimum social capital in farming. Then familism dominates the countryside and drives many rural villagers to the city, thereby creating a large

informal urban sector and forcing firms to pay high wages in order to prevent shirking on the job. Because the minority of civically minded villagers migrate, future generations of the rural population tend to have ever fewer civic members. This implies that a rural-urban economy with minimum social capital in farming eventually runs into a cultural poverty trap. We also show, however, that a significant increase in agricultural payoff may reverse this downward trend. If the incremental payoff causes a sufficient number of civic workers to stay in the rural villages, the migration dynamics may bring about an equilibrium with maximum social capital in farming. We argue that this may promote a welfare-improving equilibrium with high urban employment and production.

Hereafter, in Section 2, we present our model of rural-urban migration with endogenous ethics and derive two types of migration equilibria. The welfare properties of these equilibria and some policy interventions are evaluated in Section 3. Concluding remarks follow in Section 4.

2   A model of rural-urban migration with endogenous ethics

We consider an economy with two geographic zones and three economic sectors. The rural zone is the locus of the agricultural sector. The urban zone contains a formal urban sector and an informal one. Most workers are born in the rural zone, but some migrate to the urban zone. Following Harris and Todaro (1970), we assume that employment opportunities in the formal urban sector are restricted by wage-setting firms, and that the excess of rural migrants resides in the informal sector. The total labour force consists of two types of workers, whom we call 'familists' and 'citizens'. Citizens feel obliged to respect the rights of, and to keep their engagements with, non-kin. Familists do not have this universalistic ethic. They only feel obliged to deal fairly with relatives.

In the production function of the agricultural sector, social capital is a vital element. Here 'social capital' is understood to consist of social networks, reciprocity norms and trust that also extend to non-kin (cf. Knack and Keefer, 1997; Ostrom, 2000; Putnam, 1993; Rothstein, 2005). We assume that the amount of social capital increases with the fraction of workers who comply with social norms that assign rights to non-relatives. It is well known that the moral economy of farming communities has many such norms. Community members should keep their animals out of someone else's crop, respect traditional grazing rights and corridors of pastoralists, not encroach on other people's parcels, be honest with buyers and sellers, reimburse their loans, and so on and so forth. If more people comply with such universalistic norms, trust and cooperation between non-kin – that is, social capital – will increase, so that new farming systems, market relations, and supply and marketing chains can more easily develop. Accordingly, we assume that individual incomes in the agricultural sector depend positively on the amount of social capital.[1]

Yet complying with social norms that assign rights to non-kin also entails a private cost –

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[1] For example, Narayan and Pritchett (1999) find that villages in rural Tanzania with more social capital – measured in terms of involvement in voluntary associations – have higher incomes.

the income foregone by keeping one's engagements and respecting the rights of others. This cost is such that, in principle, it is individually rational to deviate. To contribute or not to the stock of social capital thus becomes a social-dilemma game. The inefficient outcome – minimal social capital and low agricultural incomes – may be prevented, however, because we assume that the civically-minded workers always want to comply with universalistic norms, and if they do, sanction anyone who does not.

A crucial assumption is that the civic ethic in the rural-born labour force increases over time when familist workers also comply with universalistic norms. By this, we follow the idea of sociologists like Seligman (2000) that trust evolved out of precarious solutions that individuals find for practical problems is integrated in cultures and personalities by socialization. As a consequence, the ethic (familist or civic) composition of the rural-born labour force becomes an endogenous variable. The same is true for all the workers in the urban sector, for we assume that they largely consist of rural migrants (for simplicity's sake, we see the composition of urban-born workers as exogenous).

In the formal urban sector, familists and citizens differ in their shirking behaviour. Familists feel less obliged to keep their engagements with employers, with whom they have no kin-like relationship. Therefore, they have a higher propensity to shirk than citizens. Following the shirking hypothesis in Shapiro and Stiglitz (1984),[2] where employers combat shirking by paying non-market clearing wages, we assume that the minimum wage required to elicit full work effort (the no-shirking wage) is higher in the case of familists. Assuming also that formal-sector employers cannot observe the type of a worker, they effectively have to choose between two hiring policies. One is to hire workers at the high no-shirking wage of familists, thus inducing a workforce where no one shirks. The other is to hire workers at the lower no-shirking wage of citizens and thus allow for a partially shirking workforce (although there is a probability that a shirking worker will be caught and fired). Which policy leads to the lowest effective labour costs (wages over expected productivity) depends on the fraction of familists among all the workers in the urban sector. The higher this fraction, the more likely it is that the optimum policy requires paying the high no-shirking wage of familists. As long as this remains the optimum policy, the effective labour costs are independent of small changes of the fraction of familists, but we will see that once the optimum policy switches to paying the low no-shirking wage, effective labour costs fall as the fraction of familists fall. Consequently, the rate of urban underemployment is high if employers pay the high no-shirking wage of familists – so a large fraction of urban workers are forced into the informal sector – and lower if employers pay the low no-shirking wage of citizens.

Accordingly, we will distinguish between underemployment equilibria and 'high'-employment equilibria, where the underemployment rate is lower. In an underemployment (high-employment)

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[2] The Harris-Todaro model assumes an exogenously fixed urban wage to explain persistent underemployment among rural migrants. Our introduction of the shirking hypothesis of Shapiro and Stiglitz to endogenize the level of urban wages is not new, see, e.g., Moene (1988) or Basu (2004). Also note that the dual economy of Banerjee and Newman (1998) exhibits an asymmetric information structure. In their analysis, the large information asymmetries in the modern sector as compared with those in the traditional sector hamper the credit availability in the modern sector and so migration to this sector.

equilibrium, all firms pay the high (low) no-shirking wage and no individual firm can raise its profits by attracting workers from the informal sector with the low (high) no-shirking wage. It basically implies that underemployment equilibria exist when the share of citizens among urban workers is low, whereas high-employment equilibria exist when the share of citizens is high.

The analysis below focuses on the situation where the economy is trapped in an underemployment equilibrium. After analyzing the conditions that may lead to such an equilibrium, we investigate which factors may generate an increase in civic-mindedness among urban job applicants and thereby eventually break the trap.

2.1   Rural zone

Suppose the rural zone is inhabited by fixed numbers of citizens and familists, who are all engaged in agricultural production. They are randomly divided among a given number of equally large local communities ('villages'), so the fraction of citizens is the same everywhere. In each village, workers are involved in a public-goods game. We first give a formal definition of this game and then explain what it means.

For a given integer $n \geq 2$, let $\mathcal{N} := \{1, \ldots, n\}$ denote the set of workers in a village. Let $\mathcal{N}^0$ denote the set of familists and $\mathcal{N}^1$ the set of citizens, so $\mathcal{N}^0$ and $\mathcal{N}^1$ are disjoint subsets of $\mathcal{N}$ with $\mathcal{N}^0 \cup \mathcal{N}^1 = \mathcal{N}$. Similarly, their numbers are $n^0 := \#\mathcal{N}^0$ and $n^1 := \#\mathcal{N}^1$, so $n^0 + n^1 = n$. Further, just to ease notation, define the function $h : \mathcal{N} \to \{0, 1\}$ by $h(i) := j$ if $i \in \mathcal{N}^j$. Now, the agricultural-sector game is a game in strategic form where each player $i \in \mathcal{N}$ has an action set $X_i := \{0, 1\}$ and, with $X := X_1 \times \cdots \times X_n$ and $\mathbf{x} = (x_1, \ldots, x_n)$, a payoff function $f_i : X \to \mathbb{R}$ given by

$$f_i(\mathbf{x}) := b(k + \frac{\sum_{l \in \mathcal{N}} x_l}{n}) - c x_i - h(i) d(1 - x_i) - s \frac{\sum_{l \in \mathcal{N}^1} x_l}{n}(1 - x_i), \qquad (1)$$

where the following inequalities hold:

$$0 < \frac{b}{n} < c < b, \qquad (2)$$

$$d > c - \frac{b}{n}, \qquad (3)$$

$$k \geq 1, \ s > 0. \qquad (4)$$

In this game, each worker must decide on whether to comply ($x_i = 1$) or not ($x_i = 0$) with universalistic norms, given the actions of the other villagers. The first term of f_i refers to the income that an agricultural worker realizes by producing. We see it as follows. Suppose that agricultural labour has a diminishing marginal product and that the stock of social capital K raises factor productivity (see Dasgupta, 2003). Then the agricultural production function looks like AKn^α with $A > 0$ and $\alpha < 1$. With p as the relative price of the product, productive income per worker follows as $pAKn^{\alpha-1}$, or $\pi K n^{\alpha-1}$ ($\pi := pA$ will return in Section 3 which studies the effects of changes in agricultural prices and technical innovations). So the first

term of f_i can be regarded as productive income per agricultural worker if $b = \pi n^{\alpha-1}$ and $k + \sum_{l \in \mathcal{N}} x_l/n = K$. Then k refers to the minimum amount of social capital and $\sum_{l \in \mathcal{N}} x_l/n$ to an additional amount of social capital, which (for simplicity) just equals the fraction of compliers. Hence, given the actions of the others, complying increases a worker's productive income by b/n, and this increment reflects his contribution to the stock of social capital. Note that, according to this specification, productive income per worker does not only fall if more workers deviate from universalistic norms, but also if the land is crowded with more workers (a higher number of players n), that is, if there is less migration.

The second term of f_i implies that complying entails a cost c. This is the income foregone by being honest with non-kin. Because of restriction (2), this cost is high enough to make the individual net benefit from deviating, $c - b/n$, strictly positive. Indeed, if d and s in (1) were to be zero, we would have a standard public-goods game with a unique Nash equilibrium that is inefficient (because $c < b$). It would be individually rational to violate the universalistic norms, thereby restricting social capital to its minimum amount (k), even though it would be efficient for all to comply, thus generating the maximum amount of social capital ($k + 1$). Note that our specification of productive income implies that the net benefit from deviating increases when agricultural prices fall or population pressure on the land goes up. To some extent this is because of our assumption that the cost of complying is constant. In practice, however, when the value of the output declines, some elements of this cost will decrease, whereas some other elements of this cost will increase. For example, falling output prices may decrease the advantages of letting too many cattle graze on the common pastures but also may entail higher indebtedness for farmers. By treating the cost of complying as a constant, we assume that these effects will balance out.

With the third and fourth term of f_i, the game introduces social-psychological elements that may prevent the inefficient outcome (see, e.g., Akerlof, 1980; Akerlof and Dickens, 1982; Haagsma and Koning, 2002). The third term implies that a civically-minded worker faces a cost d if he deviates from universalistic norms. This is a psychological cost. We see it as a dissonance cost that people incur when they act against the ethic they have internalized (Festinger, 1957). Familists do not face this dissonance cost because they lack a universalistic ethic. Restriction (3) implies that the dissonance cost is higher than the net benefit from deviating ($c - b/n$), so that in a Nash equilibrium civic workers always comply.

The final term of f_i introduces a reputation cost that is incurred by all non-compliers. This cost is proportional with the (observable) number of civic workers who comply with universalistic norms, and can be seen as social sanctions delivered by them. One can think of a situation where a civically-minded complier sanctions each non-complier once and where the impact of being sanctioned by one person is inversely proportional to the total number of villagers s/n (a larger village reduces the impact of the sanctions delivered by an individual villager). Note that the reputation cost is independent of the number of complying familists. This is because only compliers who have internalized the civic ethic are motivated to express disapproval when people

deviate from universalistic norms (Haagsma and Koning, 2002).[3]

The game always has a Nash equilibrium and generally it is unique. The nature of the equilibrium depends on how large the fraction of citizens in the village n^1/n is with respect to a certain threshold τ, which is defined by

$$\tau := \frac{c - b/n}{s}. \tag{5}$$

Note that $0 < \tau < 1$. In this way we arrive at three types of Nash equilibria:

Proposition 1 *Consider an agricultural-sector game.*

- *If $\frac{n_1}{n} < \tau$, then a unique Nash equilibrium ($\mathbf{x}^*$) exists. Citizens comply ($x_i^* = 1$ for $i \in \mathcal{N}^1$) but familists violate ($x_i^* = 0$ for $i \in \mathcal{N}^0$).*

- *If $\frac{n_1}{n} > \tau$, then a unique Nash equilibrium ($\mathbf{x}^*$) exists. Both citizens and familists comply ($x_i^* = 1$ for $i \in \mathcal{N}$).*

- *If $\frac{n_1}{n} = \tau$, then multiple Nash equilibria ($\mathbf{x}^*$) exist. Citizens comply ($x_i^* = 1$ for $i \in \mathcal{N}^1$) but the actions of familists may individually differ ($x_i^* \in \{0, 1\}$ for $i \in \mathcal{N}^0$).*

(See Appendix for a proof.) If the fraction of citizens falls below the threshold, the total amount of sanctions delivered to a potential non-complier is less than the net benefit from non-compliance $c - b/n$. In a Nash equilibrium all familists then violate universalistic norms. If the fraction of citizens exceeds the threshold, the total amount of sanctions delivered to a potential non-complier is high enough to induce familists to comply. The case of $n^1/n = \tau$ is in fact a borderline case. Just to ease the exposition, we will assume here that all familists violate the norms.

Given a Nash equilibrium, we are now able to determine the agricultural payoffs to familists and citizens, and thereby set the stage for a discussion of the migration decision. Let L_A denote the total number of workers in the agricultural sector. No generality is lost by normalizing the fixed number of villages to one, so $L_A = n$ (and $L_A^j := n^j$ ($j = 0, 1$)). Following our earlier remarks, we define

$$b(L_A) := \pi L_A^{\alpha-1} \ (0 < \alpha < 1; \pi > 0) \text{ and } \tau(L_A) := \frac{c - b(L_A)/L_A}{s}. \tag{6}$$

To ensure that $b(L_A)$ meets the restrictions of the agricultural-sector game, we consider values of L_A that lie in the interval $(L_A^-, N_R]$,[4] where N_R denotes the rural-born labour force (agricultural

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[3]With the implicit assumptions about sanctioning, the above game is compatible with a two-stage setting where workers in the first stage decide on following or breaking the norms and in the second stage decide on punishing or ignoring deviants. After stage one, familists reduce their payoffs if they sanction deviants. The same holds for citizens who chose to deviate. Only complying citizens will engage in sanctioning deviants, since that will prevent a decrease of their payoffs. Hence, in stage one, each worker can foresee that breaking the norms will meet social disapproval in stage two only by fellow citizens who comply. The outcomes of the two games thus coincide. Finally, note that assuming $k \geq 1$ is sufficient for having strictly positive payoffs in any Nash equilibrium (see (7)).

[4]The interval relates to restriction (2): $L_A = L_A^-$ solves $b(L_A)/L_A = c$ and N_R is such that $c < b(N_R)$. It is easily verified that the interval is non-empty.

workers plus migrants). Also, for brevity's sake, let $\bar{n}^1$ indicate the fraction of civic workers, so $\bar{n}^1 := n^1/n$. Then it is not difficult to show that, for fixed $L_A \in (L_A^-, N_R]$ and $\bar{n}^1 \in [0,1]$, the agricultural payoff to a type j worker $(j = 0, 1)$ in a Nash equilibrium is given by

$$
v^j(L_A, \bar{n}^1) := \begin{cases} b(L_A)(k + \bar{n}^1) - s\bar{n}^1 - j(c - s\bar{n}^1) & \text{if} \quad 0 \le \bar{n}^1 \le \tau(L_A) \\ b(L_A)(k + 1) - c & \text{if} \quad \tau(L_A) < \bar{n}^1 \le 1. \end{cases} \tag{7}
$$

We see that in the case of relatively little civic-mindedness among villagers, $v^0 > v^1$ holds.[5] So familists, who all violate universalistic rules, receive a higher payoff than citizens, who all comply. In the other case of much civic-mindedness, $v^0 = v^1$ holds. In this case, familists and citizens both comply and have the same agricultural payoffs.[6]

2.2 Migration decision

The migration decision of a member of the rural-born labour force is discussed in a dynamic setting of the economy similar to that of Shapiro and Stiglitz (1984). In this setting, the number of individuals opting for agricultural work L_A and the fraction of citizens among them $\bar{n}^1$ are endogenous variables that are determined in a steady state.

Suppose workers live in an economy with continuous time. Through retirement or death, they (exponentially) exit the labour force (of size N) at the constant rate δ, and are instantaneously replaced by an equal number of new entrants. Specifically, let N_R and N_U denote the time-invariant sizes of the rural-born and urban-born labour forces, so

$$
N_R + N_U = N \tag{8}
$$

with $N_R, N_U > 0$. Then δN_R workers enter the rural-born labour force and δN_U workers enter the urban-born labour force per unit time. Anyone entering the rural-born labour force makes a choice between working in agriculture or migrating to the city. In the case of migration, he will flow into the urban informal sector, just as all the urban-born entrants do. So if M denotes the steady state number of migrants,

$$
M := N_R - L_A, \tag{9}
$$

we assume that, per unit time, δM rural migrants plus δN_U urban-born entrants arrive in the informal sector of the urban economy in search of a formal-sector job. If L_I is the steady state number of workers in the informal sector and L_F the steady state number of those with formal-sector jobs (so $L_A + L_I + L_F = N$), the outflow from the labour force per unit time is then δL_A workers from the agricultural sector plus δL_I informally employed and δL_F formally employed workers from the urban sector.

Leaving the countryside for the urban informal sector may be advantageous. We will see

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[5] Because $c > s\bar{n}^1$ if $\bar{n}^1 \le \tau(L_A)$.

[6] For simplicity, hereafter we treat L_A and $\bar{n}^1$ as real variables and thus ignore that L_A must be an integer and $\bar{n}^1$ a ratio of integers.

that, in a steady state, informal-sector workers have a strictly positive rate of job finding, so the expected duration of being in the informal sector is restricted. A type j member of the rural-born labour force wants to migrate only if his expected lifetime utility from entering the informal sector, denoted by V_I^j, is equal to or greater than his expected lifetime utility from agricultural work, V_A^j. Hence, he migrates if and only if

$$V_I^j \geq V_A^j \quad (j = 0, 1). \tag{10}$$

Because our steady state is supposed to have agricultural employment, the inequalities cannot be strict for both familists and citizens. If condition (10) holds for a type j worker, then he is willing to migrate when given the opportunity, and this occurs with positive probability m^j per unit time.[7] If condition (10) does not hold, $m^j = 0$.

The possibility of migration implies that a worker's expected lifetime utility in the agricultural sector depends on that in the urban informal sector. We assume that the agricultural-sector game is played once per unit time, whether there is a steady state or not, and that the game immediately results in a Nash equilibrium. The equilibrium payoffs are given by (7), where L_A and $\bar{n}^1$ are the relevant data of some moment in time. Also, the workers have myopic expectations in that they expect that their equilibrium payoffs will remain the same in the future if they were to stay in the agricultural sector. Then it can be shown that, at some point in time, expected lifetime utility from agricultural labour for a type j worker is given by

$$V_A^j = \frac{v^j(L_A, \bar{n}^1) + m^j V_I^j}{r + \delta + m^j}, \tag{11}$$

where r is a constant time discount rate and δ is the exit rate.[8]

2.3   Urban zone

In the urban formal sector, when hired for a job, workers have a choice between working and shirking. Working entails an effort cost whereas shirking does not, but one may get caught and fired. Following Shapiro and Stiglitz (1984), employers can avoid shirking by raising wages. Higher wages cause underemployment – i.e., create an informal sector – and thus generate an opportunity cost of shirking.

We assume that reputation and sanctioning mechanisms do not affect the decisions of formal-sector workers. There are a number of reasons for this: the relative anonymity of the typical formal-sector workplace, the fact that shirking raises rather than lowers the wages of other formal-

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[7]Per unit time, the inflow of type j workers into the rural sector is δN_R^j and the outflow from the sector is δL_A^j exits plus $m^j L_A^j$ migrants. So in a steady state (of the overall economy), $\delta(N_R^j - L_A^j) = m^j L_A^j$ holds, or $m^j = \delta(N_R^j - L_A^j)/L_A^j$.

[8]Eq. (11) follows from the fundamental asset equation for a type j worker: $rV_A^j = v^j + m^j(V_I^j - V_A^j) - \delta V_A^j$, which states the principle that interest rate times asset value equals the flow of benefits plus expected capital gains (or losses). For example, $V_I^j - V_A^j$ is the change in asset value from migration, which occurs at a rate m^j. (See, *e.g.*, Shapiro and Stiglitz, 1984, for a derivation of the asset equation.)

sector workers, and the difficulty of blacklisting to prevent a fired worker from finding a job in another enterprise. Nevertheless, rural migrants bring their own personal ethic with them, and the critical assumption we make is that a civically-minded worker suffers a personal dissonance cost when he shirks. It implies that the no-shirking wage of citizens (the minimum wage for full work effort) is lower than that of familists. Yet we assume that employers cannot identify what type a worker is, so they offer a uniform wage and hire randomly.

Therefore, suppose there are a large number of competitive risk-neutral firms producing the numéraire good with constant returns to effective labour. For simplicity, each worker supplies one unit of effective labour if he does not shirk, and contributes nothing if he shirks. There is an exogenous probability q per unit time that a shirker will be caught. In that case, he joins the underemployed in the informal sector (there is no migration back to the agricultural sector). An informal-sector worker has a probability a per unit time of acquiring a job in a firm, which is an endogenous variable. Since employers do not know which type of a worker they are dealing with, job acquisition rate a is the same for citizens and familists.

Consider the work-or-shirk decision. Suppose both citizens and familists incur an effort cost e per unit time if they work. A citizen also suffers a dissonance cost $\tilde{d}$ if he shirks. However,

$$0 < \tilde{d} < e, \tag{12}$$

so the net-effort cost of a civic worker is still positive. If $V_F^j(\mathrm{N})$ and $V_F^j(\mathrm{S})$ denote the respective expected lifetime utilities of an employed type j worker ($j = 0, 1$) in the case of non-shirking and in the case of shirking, then a type j worker will choose not to shirk if and only if $V_F^j(\mathrm{N}) \geq V_F^j(\mathrm{S})$. In the Appendix, we show that these conditions produce the following so-called aggregate no-shirking constraints (NSC):

$$w \geq \tilde{w} + e + \frac{(a + r + \delta)(e - j\tilde{d})}{q} \quad (j = 0, 1). \tag{13}$$

Here w is the wage offered by firms and $\tilde{w}$ ($\tilde{w} \geq 0$) a constant representing the fallback income of a person in the informal sector.

Now suppose $w = w^j$ solves (13) as an equality. Note that $w^0 > w^1$. Treating the job-finding rate a as given, a competitive firm has, in principle, two employment options. One is to hire workers at the high no-shirking wage of familists w^0, thus creating a workforce where no one shirks. The other is to hire workers at the low no-shirking wage of citizens w^1 and thus allow for a workforce where familist employees will shirk. In an underemployment equilibrium, all firms pay the high no-shirking wage w^0 and no individual firm can raise profits by choosing the alternative employment option.[9]

The equilibrium no-shirking wage w^0 depends positively on formal-sector employment. To

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[9] The condition that no firm has a better alternative plays no role in the article of Strand (1987), which also extends the Shapiro-Stiglitz model to two types of workers, because it is assumed there that one of the two types always wants to shirk, *i.e.* regardless of the wage paid.

see this, we determine the job-finding rate a in a steady state. The inflow into the informal sector then equals δM rural migrants plus δN_U urban-born entrants per unit time (no people are fired, as no-one shirks), whereas the outflow from this sector equals aL_I job finders and δL_I exits. It implies

$$a = \frac{\delta L_F}{N - L_A - L_F}. \tag{14}$$

Here δL_F is the number of job vacancies that arise per unit time because of exits from the labour force. The denominator refers to the size of the informal sector L_I, which equals the difference between urban labour supply $N - L_A$ and formal employment L_F. Substituting (14) into (13) for $j = 0$, the aggregate NSC relevant for an underemployment equilibrium becomes

$$w \geq \tilde{w} + e + \frac{e}{q}\left(\frac{\delta(N - L_A)}{N - L_A - L_F} + r\right). \tag{15}$$

Figure 1 shows the constraint for a given quantity of urban labour supply. It is seen that the no-shirking wage w^0 increases with formal employment L_F, and goes to infinity as the latter approaches urban labour supply $N - L_A$. So a situation with no shirking is inconsistent with full employment in the formal sector: there has to be some underemployment, and this creates the informal sector.

A competitive firm hires workers up to the point where the value of the marginal product of effective labour equals the cost of effective labour. Let us assume that the former simply equals 1. Since a non-shirking worker supplies one unit of effective labour, the effective-labour cost in an underemployment equilibrium equals w^0. Hence, in such an equilibrium, $w^0 = 1$. Now also assume

$$\Delta := 1 - \left(\tilde{w} + e + \frac{e}{q}(\delta + r)\right) > 0. \tag{16}$$

We will see shortly that Δ indicates the expected payoff in the informal sector in excess of fallback income $\tilde{w}$. Figure 1 presents the equilibrium level of formal employment L_F^* for given urban labour supply $N - L_A$ and also illustrates the importance of assuming $\Delta > 0$. The following holds

$$L_F^* = \left(\frac{\Delta}{\Delta + e\delta/q}\right) \cdot (N - L_A). \tag{17}$$

The role of the agricultural sector is clear. Higher agricultural employment decreases rural-urban migration and so reduces urban labour supply and formal-sector employment. As long as the economy is trapped in an underemployment equilibrium, the ethical composition of workers has no direct impact on this. The only implicit factor is the assumption that the share of familists in the urban labour supply is so large that all firms prefer to pay the high no-shirking wage. Further, noting that $(N - L_A - L_F)/(N - L_A)$ measures the urban underemployment rate (the share of urban labour supply that is working in the informal sector), in our steady state, this rate equals $\delta/(a^* + \delta)$, where $a^* := \Delta q/e$ is the equilibrium job-finding rate. Hence, the underemployment rate is independent of how many rural-born workers migrate to the cities.

Finally, it can be shown that the equilibrium expected lifetime utility for an unemployed person is

$$V_I^j = \frac{\tilde{w} + \Delta}{(r + \delta)} \quad (j = 0, 1) \tag{18}$$

and that it is such that $V_I^j < V_U^j(N)$, so everyone in the informal sector has an incentive to apply for a job (see Appendix).

2.4 Lock-in condition

Our next step is to analyse under which conditions the economy, in the short run, becomes locked into an underemployment equilibrium. For this, we have to derive the equilibrium side condition that no individual firm can raise its profits by setting the low no-shirking wage. So let us assume an underemployment equilibrium where unemployment is large enough to enable an arbitrary firm to satisfy its labour demand by setting the low wage w^{1*} (w^1 evaluated at $a = a^*$). Besides civic applicants, this wage will attract familist applicants because it exceeds their fallback income $\tilde{w}$. The wage violates the aggregate no-shirking constraint of familists (13), so any familist employee will shirk and only civically-minded employees will work. Expected output of a random worker then depends on the fraction of citizens in urban labour supply. We denote this fraction by $\bar{u}^{1*}$ and assume that it is known to employers. Moreover, workers are expected to stay shorter at their jobs, because everyone is continually searching for a job in another firm that pays the high no-shirking wage.[10] It is natural to assume that the probability that a worker will quit is given by a^* per unit time.

Given these assumptions, the expected effective labour costs in the case of hiring at the low wage can be written as $w^{1*}/E(\bar{u}^{1*})$, where $E(\bar{u}^1) := (r + \delta + a^* + q)\bar{u}^1/(r + \delta + a^* + q\bar{u}^1)$.[11] Note that E is continuous and strictly increasing on $[0, 1]$ with $E(0) = 0$ and $E(1) = 1$. Since in an underemployment equilibrium effective labour costs are equated to 1, no firm can gain from setting the low wage if $w^{1*} \geq E(\bar{u}^{1*})$. Because $w^{1*} = 1 - (1 - \tilde{w} - e)\tilde{d}/e < 1$, it follows (after some manipulations) that an underemployment equilibrium exists only if

$$\bar{u}^{1*} \leq \hat{u} := \frac{w^{1*}}{1 + \tilde{d}}, \tag{19}$$

so only if there is relatively little civic-mindedness in the urban labour supply.

Let us put this result into perspective. We know that in an underemployment equilibrium, effective labour costs are equal to the high no-shirking wage w^0 and thus are independent of the ethical composition of urban labour supply. An increase in the the fraction of citizens will eventually cause a breakdown of the equilibrium when it exceeds a certain threshold $\hat{u}$. A high-

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[10] Since the high no-shirking wage is such that familists are indifferent between shirking and working, familists also have an incentive to search for better-paid jobs.

[11] To see this, note that the expected discounted wage of a randomly hired worker is $\bar{u}^{1*}w^{1*}/(r + \delta + a^*) + (1 - \bar{u}^{1*})w^{1*}/(r + \delta + a^* + q)$ and, recalling that a shirker has output 0 rather than 1, the expected discounted output is $\bar{u}^{1*}/(r + \delta + a^*)$.

employment equilibrium may then arise, where employers offer the low no-shirking wage w^1 and accept that some of their workers will shirk. It can be shown that, as has also been suggested above, a further increase in the the fraction of citizens will lower effective labour costs and, if there are only citizens left, these costs just equal the low no-shirking wage.[12] Figure 1 illustrates that, in that case, equilibrium formal-sector employment (and production) is at its maximum (L_F^{**}), and the rate of underemployed workers in the informal sector at its minimum.[13]

The role of civic-mindedness can be further elaborated by expressing the fraction of citizens in urban labour supply as a weighted average of the fractions in the urban-born labour force, denoted by θ_U ($\theta_U > 0$), and the supply of migrants:

$$\bar{u}^1 = (1 - \mu)\theta_U + \mu \left(\frac{M^1}{M} \right), \tag{20}$$

where $\mu := M/(N_U + M)$ and M^1 is the number of civic rural migrants (M^0 will refer to familist migrants, so $M = M^0 + M^1$). Our interest lies in an early stage of economic development where the quality of urban labour supply is governed by the share of citizens among migrants (M^1/M). In this case, the size of the urban-born labour force (N_U) and its degree of civic-mindedness (θ_U) are assumed to be relatively small, as will be specified later (see (26)). In the next section we close the model by determining the numbers of familist and civic migrants for an underemployment equilibrium. This allows us to investigate the factors that may undermine such an equilibrium and thus also to derive necessary conditions for the existence of only high-employment equilibria.

2.5   Stationary equilibrium

Summarizing so far, we have seen that a given pair $(L_A, \bar{n}^1)$ identifies the numbers of familist and civic workers in the agricultural sector and their agricultural payoffs (see (7)). It also determines formal-sector employment (see (17)) and formal-sector wages (equal to 1), as well as the size of the informal sector ($N - L_A - L_F$) and expected informal incomes ($\tilde{w} + \Delta$). The lock-in condition (19) is established too, using (20) and the definitions: $M^0 := N_R^0 - (1 - \bar{n}^1)L_A$ and $M^1 := N_R^1 - \bar{n}^1 L_A$, where N_R^j ($j = 0, 1$) refers to the exogenous number of type j members of the rural-born labour force. To complete the model, we will now study the existence and stability of a pair $(L_A, \bar{n}^1)$, or (M^0, M^1), that meets the requirement of a stationary state.

Following Harris and Todaro (1970), the steady-state condition follows from the assumption that migration of type j workers is a strictly increasing function of the urban-agricultural difference in expected lifetime utilities $V_I^j - V_A^j$. Noting (11) and (18), we postulate a mechanism of

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[12] Writing $E(\bar{u}^1; a^*)$ and noting that, if all firms pay w^1, the quit rate is zero, expected effective labour costs are given by $w^1/E(\bar{h}^1; 0)$. Here $\bar{h}^1$ is the fraction of high-trust workers among the steady state number of workers hired per unit time. In the Appendix, it is shown that $\bar{h}^1$ depends positively on $\bar{u}^1$ and $\bar{h}^1 = 1$ if $\bar{u}^1 = 1$, so $w^1/E(\bar{h}^1; 0)$ is indeed strictly decreasing in $\bar{u}^1$ (given a) and $w^1/E(\bar{h}^1; 0) = w^1$ if $\bar{u}^1 = 1$.

[13] From the proof of proposition 16 in the Appendix, we can infer that the rate of underemployment in a high-employment equilibrium without familists ($N^0 = 0$) is given by $(e-\tilde{d})\delta/(\tilde{\Delta}q + (e-\tilde{d})\delta)$, where $\tilde{\Delta} := \Delta + (r+\delta)\tilde{d}/q$. Note that if $\tilde{d} = 0$, this rate equals $e\delta/(\Delta q + e\delta)$ – the rate in the underemployment equilibrium, and that this rate falls when $\tilde{d}$ rises.

adjustment over time based on a function of sign preservation:

$$\dot{M}^j = \Psi^j\left(\frac{(\tilde{w} + \Delta) - v^j(L_A, \bar{n}^1)}{r + \delta + m^j}\right) \quad \text{with } \Psi^{j\prime} > 0 \text{ and } \Psi^j(0) = 0 \quad (j = 0, 1) \tag{21}$$

where $\bar{n}^1 = (N_R^1 - M^1)/L_A$, $L_A = N_R - M^0 - M^1$, and $m^j = \delta M^j/(N_R^j - M^j)$ (see Section 2.2).[14] Contrary to Harris and Todaro's model and many other migration models, the flow of migration does not dry up in a steady state. Given a stationary solution (M_*^0, M_*^1), the instantaneous inflow of new entrants into the agricultural sector causes an outflow of $\delta(M_*^0 + M_*^1)$ workers per unit time.

Our focus is on stationary solutions where not all workers (above the minimum L_A^-) migrate nor stay in farming. This requires that agricultural incomes cannot be too high or too low, i.e.

$$v^j(N_R, j) < \tilde{w} + \Delta < v^j(L_A^- + \epsilon, j) \quad (j = 0, 1) \tag{22}$$

where $\epsilon > 0$ is infinitely small (see (7)).[15] Then there exists $L_A = \hat{L}(j)$ that solves $v^j(L_A, j) = \tilde{w} + \Delta$. This $\hat{L}(j)$ is unique and such that $L_A^- < \hat{L}(j) < N_R$ ($j = 0, 1$). Now define $L_A^a := \hat{L}(0)$ and $L_A^b := \hat{L}(1)$, and note that $L_A^a < L_A^b$ (because $b(L_A) > c$). As will be seen, L_A^a and L_A^b refer to the farm employment levels of two types of possible steady states that may be underemployment equilibria.

The stationary solutions with farm employment levels L_A^a and L_A^b critically depend on the fraction of citizens in the rural-born labour force. This fraction will be denoted by θ_R, so $\theta_R := N_R^1/N_R$. Defining two threshold levels for θ_R, viz. $\theta_R^- := \tau(L_A^b)L_A^b/N_R$ and $\theta_R^+ := 1 - L_A^b/N_R$, we assume that the rural-born labour force is so large that

$$\theta_R^- \leq \theta_R^+ \tag{23}$$

(e.g., $N_R \geq L_A^a + L_A^b$). As will be clear from Proposition 2 below, the assumption guarantees that stationary solutions exist for all fractions of civic workers θ_R.

Finally, defining the sets:

$$S^a := \{(N_R^0 - L_A^a, N_R^1)\} \tag{24}$$

$$S^b := \{(M^0, M^1) \mid M^0 = N_R^0 - (1 - \bar{n}^1)L_A^b, \ M^1 = N_R^1 - \bar{n}^1 L_A^b, \ \text{with } \bar{n}^1 \in \Omega\}, \tag{25}$$

where $\Omega := (\tau(L_A^b), 1] \cap [1 - N_R^0/L_A^b, N_R^1/L_A^b]$, all stationary solutions (M_*^0, M_*^1) that may be underemployment equilibria are identified by the following result:

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[14]More precisely, taking account of corner solutions ($M^j = 0$ or $M^j = N_R^j$), we examine the equations: $\dot{M}^j = \min\left(\max(0, M^j + \Psi^j(\frac{(\tilde{w} + \Delta) - v^j(L_R, \bar{n}^1)}{r + \delta + m^j})), N_R^j\right) - M^j$.

[15]We show this by contradiction. First, a steady state with $M_*^0 = M_*^1 = 0$ implies $(L_{A*}, \bar{n}_*^1) = (N_R, \theta_R)$. It requires $V_A^j \geq V_I^j$, or $v^j(N_R, \theta_R) \geq \tilde{w} + \Delta$ for each j. However, $v^1(N_R, \theta_R) \leq v^1(N_R, 1) < \tilde{w} + \Delta$ (by (22)) and $v^0(N_R, \theta_R) \leq v^0(N_R, 1) = v^1(N_R, 1) < \tilde{w} + \Delta$. Second, a steady state with $M^0 + M^1 = N_R - (L_A^- + \epsilon)$ implies $(L_{A*}, \bar{n}_*^1) = (L_A^- + \epsilon, \bar{n}_*^1)$ with $0 \leq \bar{n}_*^1 \leq 1$. It requires $V_A^j \leq V_I^j$, or $v^j(L_A^- + \epsilon, \bar{n}_*^1) \leq \tilde{w} + \Delta$ for each j. However, $v^j(L_A^- + \epsilon, \bar{n}_*^1) \geq v^j(L_A^- + \epsilon, 0) > \tilde{w} + \Delta$ (by (22)).

Proposition 2 *Consider the pair of differential equations (21) and denote the set of stationary solutions by $\hat{S}(\theta_R)$.*[16] *Then, with $S(\theta_R)$ given by*

$$S(\theta_R) = \begin{cases} S^a & \text{if} \quad 0 \leq \theta_R \leq \theta_R^- \\ S^a \cup S^b & \text{if} \quad \theta_R^- < \theta_R \leq \theta_R^+ \\ S^b & \text{if} \quad \theta_R^+ < \theta_R \leq 1, \end{cases}$$

it holds $S(\theta_R) \subseteq \hat{S}(\theta_R)$. Moreover, each stationary solution of S^a is asymptotically stable and each stationary solution of S^b locally stable.

(See the Appendix for a proof.)

An underemployment equilibrium is implied by a stationary solution (M_*^0, M_*^1) that meets the lock-in condition (19). Proposition 2 indicates two types of steady states. Set S^a refers to a steady state where rural-urban migration is high (for an underemployment equilibrium) and equal to $M^a := N_R - L_R^a$. Migrating are all civic workers (if any) and generally also some familists. Social capital in the agricultural sector is minimal, because there are only familists left and they all violate universalistic norms. This type of steady state may arise if the fraction of citizens in the rural-born labour force is low or only moderate, i.e., if $\theta_R \leq \theta_R^+$.

Figure 2.A illustrates this type of steady state and also shows the impact of the lock-in condition. A steady state is represented by a point on the iso-migration line: $M^1 = M^a - M^0$ (note that $(M_*^0, M_*^1) = (M^a, 0)$ if $\theta_R = 0$ and $(M_*^0, M_*^1) = (0, M^a)$ if $\theta_R = \theta_R^+$). Higher points correspond to higher values of θ_R and reflect a larger share of citizens among rural migrants (M^1/M). The lock-in condition (19) is represented by the the upward-sloping line.[17] To fix ideas, the intercept is assumed to be positive but not too large:

$$0 \leq \frac{\hat{u} - \theta_U}{1 - \hat{u}} N_U < N_R - L_A^b, \tag{26}$$

which requires a low level of civic-mindedness among the urban-born, i.e. $\theta_U \leq \hat{u}$, and a moderate number of urban-born N_U as compared with the size of the rural-born labour force. Assumption (26) basically ensures that the civic-mindedness among urban labour supply is governed by the share of citizens among migrants (M^1/M). Now, only steady states on or below this line (such as point A) satisfy the lock-in condition and, therefore, are underemployment equilibria. It follows that an underemployment equilibrium of this type exists if and only if

$$\theta_R \leq [\hat{u}M^a + (\hat{u} - \theta_U)N_U]/N_R =: \theta_R^a. \tag{27}$$

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[16]See note 14. Two other types of possible steady states generally exist as well. However, given our assumption (26) about the lock-in condition, neither type can give rise to an underemployment equilibrium, essentially because in these states only civic workers migrate to the urban sector. A discussion of these two types of possible steady states is therefore left to the Appendix (see Propositions 10 and 11). Also note that if $\theta_R = 0$ ($\theta_R = 1$), of course only M_*^1 (M_*^0) is relevant.

[17]Using (20), this condition can be written as $M^1 \leq ((\hat{u} - \theta_U)N_U + \hat{u}M^0)/(1 - \hat{u})$, which is shown as an equality in Figure 2.A.

Parameter θ_R^a refers to the value θ_R would have in the case of a steady state in point B.

The other type of steady state is implied by set S^b. This set generally involves a continuum of steady states (uniqueness applies only if $\theta_R = 1$). The continuum arises because familist and civic workers would be equally well-off in the agricultural sector and so value migration the same. Therefore, the share of citizens among migrants is undetermined. In this type of steady state, rural-urban migration is low and equal to $M^b := N_R - L_R^b$ ($< M^a$). Social capital is maximal in farming as are agricultural incomes, because also familist villagers comply with universalistic norms. A steady state may exist if the fraction of civic workers in the rural-born labour force is not too small, i.e., if $\theta_R > \theta_R^-$.

In Figure 2.B, the solid downward-sloping line to the right of point C indicates such a continuum of steady states. It assumes that θ_R is low, implying that the share of citizens among migrants (M^1/M) is bounded from above. Higher values of θ_R would move point C upwards along the iso-migration line, thus expanding the continuum with steady states with more citizens among migrants. Beyond a certain value of θ_R, familist workers become scarce, and the share of citizens among migrants will be bounded from below. This situation is illustrated by the solid part of the iso-migration line in Figure 2.C.[18] As before, only steady states on or below the upward-sloping line meet the lock-in condition. It follows that the steady states in Figure 2.B are all underemployment equilibria, whereas those in Figure 2.C are not. Therefore, an underemployment equilibrium of this type exists if and only if

$$\theta_R^- < \theta_R \leq 1 - M^b/N_R + [\hat{u}M^b + (\hat{u} - \theta_U)N_U]/N_R =: \theta_R^b. \tag{28}$$

Parameter θ_R^b refers to the value θ_R would have in the case of a continuum of steady states with a lower bound in point D. Note that $\theta_R^b > \theta_R^a$.

So our findings are summarised by the next theorem:

Theorem 3 *(Existence and stability of underemployment equilibria)*

(i) An underemployment equilibrium exhibits either a minimum stock or a maximum stock of social capital in farming.

(ii) An underemployment equilibrium with minimum social capital in farming exists if and only if $0 \leq \theta_R \leq \theta_R^a$. In this case, it is the only equilibrium of this type and it is asymptotically stable; rural-urban migration is high (for an underemployment equilibrium) and equal to M^a.

(iii) An underemployment equilibrium with maximum social capital in farming exists if and only if $\theta_R^- < \theta_R \leq \theta_R^b$. In this case, infinitely many equilibria of this type exist and they are all locally stable; rural-urban migration is low and equal to M^b.

Let us take a step back and look at the bigger picture. In the first instance, it appears that a high level of social capital in farming is not strictly needed to achieve a large share of citizens

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[18]The civic mindedness among migrants is bounded from above (as in Figure 2.B) if $\theta_R^- < \theta_R \leq \theta_R^- + M^b/N_R$, and bounded from below (as in Figure 2.C) if $1 - M^b/N_R < \theta_R \leq 1$. So if θ_R is between these two regions, S^b is represented by the entire iso-migration line (including end points).

among rural migrants. Even when social capital in farming is low, the civic-mindedness among rural migrants may be significant. The lack of social capital then restricts the productivity of agriculture so much that the cost of complying with universalistic norms (c) becomes prohibitive for civic workers. In this case, the familism that holds the countryside in its sway drives all civically minded to the city. If the share of citizens within the rural-born labour force is high enough, there is a possibility that such a steady state disintegrates, which eventually gives rise to a high-employment equilibrium. However, a steady state that does not fall apart, and thus constitutes an underemployment equilibrium, triggers tendencies that restrict the civic-mindedness among rural migrants in the long run. If everybody in the village ignores universalistic norms and no-one expresses disapproval, the socialization of future generations of rural-born is likely to produce fewer civically-minded individuals. The share of citizens will then fall over time, promoting underemployment equilibria where the flow of migrants includes ever fewer civic workers. The nation is then caught in a cultural poverty trap. The story is different for an underemployment equilibrium with a high level of social capital in farming. Since all the villagers now comply with universalistic norms, this situation will enhance the civic-mindedness among future generations. The next section investigates these possible long-run tendencies and looks for evolutionary stable equilibria.

2.6 Evolution of ethics

Consider the two types of underemployment equilibria. In an equilibrium with minimum social capital in farming, nobody complies since there are only familists left in the village ($\bar{n}^1 = 0$). Conversely, in an equilibrium with maximum social capital, everybody complies with universalistic norms because there are sufficient civically-minded villagers to enforce compliance ($\bar{n}^1 > \tau(L_A^b)$). Following Akerlof (1980), we assume that the difference between the fraction of villagers who comply with universalistic norms and the fraction of civic villagers will exert evolutionary pressure on the ethic composition of the rural-born population. Specifically, if the fraction of complying villagers is larger (smaller) than the fraction of civic villagers, the share of citizens among rural-born workers tends to rise (fall) over time. Also if the village consists solely of complying civic workers (non-complying familist workers), we may expect that future generations will include higher (lower) shares of civic workers. Elaborating this notion, we base the evolution of ethical predispositions on steady-state fractions of complying workers and civically-minded villagers (rather than considering the dynamics of migration and ethics simultaneously), in line with the general observation that attitudes tend to change more slowly than economic behaviour and, as far as they respond to economic behaviour, lag behind.

Therefore, let $\Phi : [0,1] \times [0,1] \to \mathbb{R}$ be an auxiliary function defined by

$$\Phi(a_1, a_2) := \begin{cases} \hat{\Phi}(a_1 + a_2 - 1) & \text{if} \quad a_1 = 0 = a_2 \text{ or } a_1 = 1 = a_2 \\ \hat{\Phi}(a_1 - a_2) & \text{if} \quad \text{otherwise} \end{cases} \tag{29}$$

where $\hat{\Phi}$ is a (sign-preserving) function with $\hat{\Phi}' > 0$ and $\hat{\Phi}(0) = 0$. For given θ_R, suppose an underemployment equilibrium and let λ_* denote the implied fraction of workers who comply with universalistic norms and $\bar{n}_*^1$ the fraction of civic workers in a village. Then we assume that the ethical composition of the rural-born labour force evolves over time according to[19]

$$\dot{\theta}_R = \Phi(\lambda_*, \bar{n}_*^1). \tag{30}$$

In the Appendix, we show that this leads to the following result:

Theorem 4 *(Existence and stability of underemployment equilibria in the long run)*

Suppose the evolution of ethical predispositions adjusts according to the differential equation (30).[20] Then in the long run

(i) any underemployment equilibrium with minimum social capital in farming will evolve into a unique and stable equilibrium with only familists among the rural-born ($\theta_R = 0$);

(ii) any underemployment equilibrium with maximum social capital in farming will disintegrate.

In the long run, only one type of underemployment equilibria will be sustained. As time goes by, any equilibrium with maximum social capital in farming will fall apart, whereas an equilibrium with minimum social capital will be supported by more and more familists among the rural-born. Hence, a rural-urban economy with minimum social capital in farming eventually runs into a cultural poverty trap.

3 Agricultural prices and technical innovations

Given the evolution of ethics, the short-run equilibrium with minimum social capital in farming is problematic and evokes the question whether there are interventions that can prevent the erosion of civic-mindedness in the villages. Before looking at two measures, price support and the encouragement of technological innovation, it is instructive to evaluate the welfare properties of the two types of underemployment equilibria.

3.1 Welfare and sector income

Adopting the utilitarian principle for simplicity, total welfare in an underemployment equilibrium is found by adding up the expected lifetime utilities of all workers. After some manipulations,[21] we arrive at

$$\frac{\tilde{w} + \Delta}{\delta + r} N + \frac{e}{q} L_F^*, \tag{31}$$

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[19] Just as before, we study the more precise formulation: $\dot{\theta}_R = \min(\max(0, \theta_R + \Phi(\lambda_*, \bar{n}_*^1)), 1) - \theta_R$.

[20] See note 19.

[21] Start with $(v^j(L_A, j)L_A + (1-e)L_F + (\tilde{w} + \Delta)L_I)/(r + \delta)$ and use the requirement $v^j(L_A, j) = \tilde{w} + \Delta$. Note that the low-social-capital equilibrium has $L_A = L_A^a$ and $j = 0$ and the high-social-capital equilibrium $L_A = L_A^b$ and $j = 1$.

where equilibrium employment in the urban formal sector L_F^* is given by (17). So welfare is strictly increasing in the number of workers employed in the formal sector. The reason is that the output of a formal-sector worker, $1 - e$, is higher than the output of an agricultural worker, which in equilibrium equals the expected return to migration $\tilde{w} + \Delta$ (see (16)). Since $L_A^a < L_A^b$, formal-sector employment is larger in the equilibrium with minimum social capital in farming. Remarkably, this means that total welfare in this type of underemployment equilibrium is higher. Agricultural payoffs per worker are the same in both types of underemployment equilibria, however, and also note that, by assumption (16), these payoffs exceed the actual fallback income $\tilde{w}$ of someone in the informal sector. Finally, note that in a given type of underemployment equilibrium, total welfare does not depend on the share of citizens θ_R, which essentially follows from our focus on equilibria where no-one shirks.

Despite the lower welfare of an underemployment equilibrium with maximum social capital in farming, we know that evolutionary pressures will raise the share of citizens among rural-born workers over time and sooner or later cause the underemployment equilibrium to break down. As said before, a high-employment equilibrium may then emerge, where employers pay the lower no-shirking wage of civic workers and accept that familist workers will shirk. Under the likely circumstance that the increase in the share of citizens among rural-born workers will continue, effective labour costs fall further and thus tend to raise formal-sector employment. In the Appendix (Proposition 16), it is shown that when there are only civic workers left, i.e. if the civic-mindedness has spread over the urban-born labour force as well, total welfare in the high-employment equilibrium is higher than in any underemployment equilibrium with minimum social capital in farming, provided that $\tilde{d}/q$ is not too low. Agricultural income per worker is then always higher and, under the above provision, total urban production also. Note that a higher value of $\tilde{d}/q$ implies a larger downward shift of the aggregate no-shirking constraint of civic workers in Figure 1, and that this occurs when the dissonance a citizen feels in case of shirking increases, or when employers find it more difficult to detect shirking behaviour. In short, when we take account of how the evolution of ethical dispositions responds to economic conditions, it appears that an underemployment equilibrium with a minimum level of social capital in farming is undesirable.

3.2   Policy intervention

Now let us suppose a short-run underemployment equilbrium with minimum social capital in farming, and let us see whether changes in the exogenous conditions of the agricultural sector can bring improvement. The two major policies that developed countries have applied to their agricultural sectors in their own past are price support and the encouragement of innovation. We will show that such policies may undermine the underemployment equilibrium through two different mechanisms. First, they may break the lock-in condition and thereby destabilize the underemployment equilibrium. Second, they may cause so many civically-minded workers to stay in farming that all familists in the farm sector are induced to comply with universalistic norms,

with the effect that the share of citizens among rural-born workers will increase over time.

Regarding the first mechanism, note that changes in agricultural prices or total factor productivity translate into changes in parameter π (see (6)). Focusing on price changes for now, a price rise increases agricultural employment (L_A^a) and so reduces overall migration (M^a). It does so by binding more familists to the agricultural sector while leaving the outflow of civic workers intact.[22] Higher agricultural prices thus increase the share of citizens among migrants. If the number of civically-minded migrants is relatively high, the lock-in condition (19) may not be met anymore, so that the underemployment equilibrium breaks down. To illustrate this, in Figure 2.A a rise in agricultural prices would shift the underemployment equilibrium represented by point A horizontally to the left. Point A thereby approaches the upward-sloping line that represents the lock-in condition and if it crosses this line, the underemployment equilibrium disintegrates. It should be noted, however, that since the villages are only inhabited by familists, the long-term outcome of this mechanism is uncertain. If a breakdown of the underemployment equilibrium were to lead to a temporary high-employment equilibrium where no-one of the villagers complies with universalistic norms, the share of citizens among rural-born workers θ_R would fall over time. This would cause a return to an underemployment equilibrium, which in the long run would develop into an equilibrium with no citizens among the rural-born labour force ($\theta_R = 0$).

For a real change in the cultural conditions of development, therefore, we have to look at the second mechanism. Consider that although higher agricultural prices raise the benefit from complying with universalistic norms for familists (b/n), the net benefit of non-compliance ($c-b/n$) still remains positive. Familist workers will only comply if there are sufficient civic workers in agriculture, for only then will the decreased net benefit from non-compliance fall below the inflicted sanctions. A necessary but not sufficient condition for this is that the rural-born labour force includes a number of citizens. To really change the social behaviour – and so in the longer term the evolution of ethics – in the villages, the price incentive must be large enough to prevent many of them from leaving the villages.

So suppose the number of citizens in the agricultural labour force is such that $\theta_R > \theta_R^-$. According to Proposition 2, it implies that alongside the underemployment equilibrium with minimum social capital there also exists a steady state where social capital in the farm sector is at its maximum. As for the price incentive that is needed to achieve a shift to this steady state, note that in any underemployment equilibrium with prices π' (referred to with stars), it holds $v^1(L_{A*}^a, 0; \pi') < \tilde{w} + \Delta = v^0(L_{A*}^a, 0; \pi')$. That is, for civic workers agricultural payoffs are strictly lower than the payoffs to migration. To maintain civic workers in the agricultural sector, therefore, a price $\pi'' > \pi'$ must be high enough to reverse the payoff differential and so imply a discrete change such that

$$v^1(L_{A*}^a, 0; \pi'') > \tilde{w} + \Delta. \tag{32}$$

The initial response to the price shock may be that so many civic workers remain in the village

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[22]Recall $M^a := N_R - L_A^a$ and L_A^a is such that $v^0(L_A^a, 0) = \tilde{w} + \Delta$. Also $M_*^1 = N_R^1$, so the number of civic migrants is independent of π.

that, to avoid sanctions, all familist workers choose to comply with universalistic norms. If the new ethical composition of farm workers is sufficiently close to a steady state with maximum social capital, then the migration dynamics will generally result in a stable equilibrium where all workers comply with the norms, so that over time evolutionary pressures will raise the share of citizens among rural-born workers.

How this policy works is illustrated by a phase diagram in Figure 3, which also highlights the dynamics of migration. The dashed curve represents the threshold function $\bar{n}^1 = \tau(L_A)$ (see (6), with $\bar{n}^1 = (N_R^1 - M^1)/L_A$ and $L_A = N_R - M^0 - M^1$). It divides the phase space into two basins of attraction, D^0 and D^1. In the basin D^0, where the ethical composition of the migrants is such that all familist villagers violate universalistic norms, the system is attracted to a steady state with minimum social capital in farming (point A''). In the other basin, D^1, the ethical composition of migrants implies that all familist villagers comply with universalistic norms, and the system is attracted to a continuum of steady states with maximum social capital in farming (the bold straight line, see also Figure 2.B).[23] Although initial migrant compositions in D^0 or in D^1 tend to induce adjustments to their corresponding type of steady state, it is possible that the dynamics involve familist villagers switching from non-compliance to compliance (e.g., point X, where the number of familist villagers is low) or from compliance to non-compliance (e.g., point Y, where the number of civic villagers is low). Also, the adjustment paths may interfere with the lock-in condition, which is indicated by the upward-sloping line (e.g., point Z).

Now suppose Figure 3 applies to the situation under the higher price π'' and let point A' refer to the initial equilibrium under price π' where familists do not comply with universalistic norms. A price rise to π'' may cause two kinds of initial responses. On the one hand, the price increment may reduce the migration of familist and civic workers only slightly, so that the immediately following ethical composition of migrants stays in D^0 (e.g., point B). The migration decision of civic workers is then only temporarily altered, because subsequent migration adjustments lead to a new equilibrium in point A'', where universalistic norms are still violated in the villages. On the other hand, however, it is possible that the price increment discourages the migration of familist and civic workers sufficiently to shift the immediately following ethical composition of migrants to D^1 (e.g., point C). Clearly such an elastic response tends to lead to an equilibrium where all agricultural workers comply with universalistic norms. This prompts an ethical evolution by which the underemployment equilibrium in the longer term disintegrates, after which the economy may move to a sustainable high-employment equilibrium.

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[23] For relevance, the steady state with minimum social capital is an underemployment equilibrium, so θ_R is not only such that $\theta_R^- < \theta_R \leq \theta_R^+$ but also $\theta_R \leq \theta_R^a$ (which requires $\theta_R^- < \theta_R^a$). Point A'' is the intersection of the demarcation curves $\dot{M}^0 = 0$ (the downward-sloping curve through A'', given by $v^0(L_A, \bar{n}^1) = \tilde{w} + \Delta$ with $\bar{n}^1 < \tau(L_A)$ (in terms of M^0 and M^1)) and $\dot{M}^1 = 0$ (the horizontal line through A'' in D^0 and then the downward-sloping curve starting at $(N_R^0 - \tilde{L}, N_R^1)$, given by $v^1(L_A, \bar{n}^1) = \tilde{w} + \Delta$ with $\bar{n}^1 < \tau(L_A)$). The continuum of steady states follows from $\dot{M}^0 = 0$ (the bold straight line, given by $v^1(L_A, \bar{n}^1) = \tilde{w} + \Delta$ with $\bar{n}^1 > \tau(L_A)$) and $\dot{M}^1 = 0$ (the horizontal line through $(0, N_R^1)$ in D^1 and the bold straight line). The directional arrows indicating the intertemporal migration movements are readily implied by the proof of Proposition 2. Finally, it can be shown that an increase of π shifts all the curves to the left.

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4 Conclusion

We studied a model of a Harris-Todaro type of economy with efficiency wage setting in the urban sector and an endogenous social-capital base in the rural sector. Our focus was to show that, in a developing economy, progress in agriculture may stimulate growth of the urban sector through important non-market-mediated effects. We have shown that if civic-mindedness among the rural-born is relatively low, an equilibrium exists with minimum social capital in farming. Here familism dominates the countryside and drives many people to the city, resulting in a large informal urban sector and forcing firms to pay high wages in order to prevent shirking on the job. Because the minority of civically minded villagers migrate, and no-one complies with universalistic norms, future generations of rural-born tend to have ever fewer civic members. This implies that a rural-urban economy with minimum social capital in farming will ultimately run into a cultural poverty trap. However, we have also shown that if civic-mindedness among the rural-born is not too low, a significant increase in agricultural payoff may reverse this downward trend. If the incremental payoff induces a sufficient number of civic workers to stay in the rural villages, the migration dynamics may result in an equilibrium with maximum social capital in farming. In this type of equilibrium, rural-urban migration is relatively low, as is the size of the informal sector. More importantly, since all villagers now comply with universalistic norms, future generations of rural-born will presumably demonstrate more civic-mindedness. We have argued that this may promote a welfare-improving equilibrium with high urban employment, where firms pay the low no-shirking wage of civic workers and accept that only a small minority of familist workers will shirk.

In conclusion then, higher living standards enable traditional agricultural societies to solve their social dilemmas, which implies a stream of civic-minded rural-urban migrants that improves the quality of the urban labour force and thus sets the stage for nationwide economic growth. Unfavourable conditions in agriculture, however, can lead to a cultural poverty trap that hampers the structural transformation of a traditional economy. Public investment in hard and soft infrastructures for agricultural development can help break this trap, as can policies that improve price relations for farmers. As well as stimulating domestic markets and other market-mediated linkage effects, such policies may also be important for creating cultural linkage effects that stimulate non-farm growth. Policies that raise agricultural prices may be introduced stepwise to cushion the effect on poor consumers. However, our analysis suggests that when they are implemented too gradually, the positive effect on the economic culture may be eroded by demographic adjustment. Rather than introducing price supports very slowly, therefore, it may be better to compensate poor consumers by measures like employment projects and school meals. If the former are used to build rural roads and the latter are based on domestically-grown foods, additional incentives are created that may stimulate the formation of social capital in the villages. Improving price ratios for farmers may require policies such as input subsidies, import tariffs or even international commodity controls for tropical export crops. Pleas for such measures conflict with the liberal recipes that many development economists and international donors have been

prescribing to poor countries in recent decades. These recipes have failed to produce results. To explain this lack of success, liberal-economic experts often point to socio-political problems that would supposedly be exogenous to the economic system itself. An implication of our model is that these problems may be at least partly of their own making.

Appendix

Lemma 5 *Suppose* $\mathbf{x}^*$ *is a Nash equilibrium of an agricultural-sector game. Let* $y := \sum_{l \in \mathcal{N}^1} x_l^*$. *Then*

(i) *for* $i, j \in \mathcal{N}^0$, $x_i^* = x_j^*$ *if* $y \neq \tau n$;

(ii) *for* $i, j \in \mathcal{N}^1$, $x_i^* = x_j^*$.

Proof. We proceed by contradiction: fix $h \in \{0, 1\}$ and suppose $i, j \in \mathcal{N}^h$ with $x_i^* \neq x_j^*$. We may also suppose $x_i^* = 0$ and $x_j^* = 1$. Let $z := \sum_{l \in \mathcal{N}} x_l^*$ and note that $y - h \geq 0$ and $z \leq n - 1$. Because $\mathbf{x}^*$ is a Nash-equilibrium, $f_i(0; \mathbf{x}_i^*) \geq f_i(1; \mathbf{x}_i^*)$ and $f_j(1; \mathbf{x}_j^*) \geq f_j(0; \mathbf{x}_j^*)$.[24] Therefore,

$$f_i(0; \mathbf{x}_i^*) = b(k + \frac{z}{n}) - hd - s\frac{y}{n} \geq b(k + \frac{z+1}{n}) - c = f_i(1; \mathbf{x}_i^*)$$

or

$$c - \frac{b}{n} - hd - s\frac{y}{n} \geq 0,$$

and

$$f_j(1; \mathbf{x}_j^*) = b(k + \frac{z}{n}) - c \geq b(k + \frac{z-1}{n}) - hd - s\frac{y-h}{n} = f_j(0; \mathbf{x}_j^*)$$

or

$$c - \frac{b}{n} - hd - s\frac{y}{n} \leq -h\frac{s}{n}.$$

Hence, in case $h = 1$, we have a contradiction. In case $h = 0$, we also have a contradiction if

$$c - \frac{b}{n} - s\frac{y}{n} \neq 0,$$

or, using (5), if $y \neq \tau n$. ∎

Lemma 6 *Consider an agricultural-sector game. Then, for each Nash equilibrium* $\mathbf{x}^*$, *it holds that* $x_i^* = 1$ *for* $i \in \mathcal{N}^1$.

Proof. By contradiction. So suppose $\mathbf{x}^*$ is a Nash equilibrium and $x_i^* = 0$ for some $i \in \mathcal{N}^1$. Then $f_i(0; \mathbf{x}_i^*) \geq f_i(1; \mathbf{x}_i^*)$. Now let $z := \sum_{l \in \mathcal{N}} x_l^*$ and $y := \sum_{l \in \mathcal{N}^1} x_l^*$ and note that $y \geq 0$ and $z \leq n - 1$. Then it must hold that

$$f_i(0; \mathbf{x}_i^*) = b(k + \frac{z}{n}) - d - s\frac{y}{n} \geq b(k + \frac{z+1}{n}) - c = f_i(1; \mathbf{x}_i^*)$$

or

$$c - \frac{b}{n} \geq d + s\frac{y}{n},$$

which contradicts assumption (3). ∎

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[24] Here $\mathbf{x}_i^*$ refers to the Nash equilibrium actions of the players other than i.

Proof of Proposition 1.   Suppose $\mathbf{x}^*$ is a Nash equilibrium. Let $y := \sum_{l \in \mathcal{N}^1} x_l^*$. Then Lemma 6 implies $y = n^1$. Together with Lemma 5, we have that if $\frac{n_1}{n} \neq \tau$, the Nash equilibria must be symmetric and such that either (1) $x_i^* = 1$ for $i \in \mathcal{N}$ or (2) $x_i^* = 1$ for $i \in \mathcal{N}^1$ and $x_i^* = 0$ for $i \in \mathcal{N}^0$.

Ad (1). Suppose a multi-action $\mathbf{x}^*$ with $x_i^* = 1$ for $i \in \mathcal{N}$. Then it is a Nash equilibrium if and only if $f_i(1; \mathbf{x}_i^*) \geq f_i(0; \mathbf{x}_i^*)$ for all i. Now, for $i \in \mathcal{N}^h$ with $h \in \{0, 1\}$,

$$f_i(1; \mathbf{x}_i^*) = b(k+1) - c \geq b(k + \frac{n-1}{n}) - hd - s\frac{n^1 - h}{n} = f_i(0; \mathbf{x}_i^*)$$

if and only if

$$hd + s\frac{n^1 - h}{n} \geq c - \frac{b}{n}.$$

Since $n^1 \geq h$, assumption (3) implies that this inequality holds for $i \in \mathcal{N}^1$. Using (5) and letting $h = 0$, the inequality holds for $i \in \mathcal{N}^0$ if and only if $\frac{n^1}{n} \geq \tau$. So we find that if $\mathcal{N}^0 \neq \emptyset$, $\mathbf{x}^*$ is a Nash equilibrium if and only if $\frac{n^1}{n} \geq \tau$. If $\mathcal{N}^0 = \emptyset$, so if $n^1 = n$, $\mathbf{x}^*$ is always a Nash equilibrium (since $\tau < 1$).

Ad (2). Suppose a multi-action $\mathbf{x}^*$ with $x_i^* = 1$ for $i \in \mathcal{N}^1$ and $x_i^* = 0$ for $i \in \mathcal{N}^0$. By Lemma 6, for a Nash equilibrium we only have to show that $f_i(0; \mathbf{x}_i^*) \geq f_i(1; \mathbf{x}_i^*)$ for $i \in \mathcal{N}^0$. Now,

$$f_i(0; \mathbf{x}_i^*) = b(k + \frac{n^1}{n}) - s\frac{n^1}{n} \geq b(k + \frac{n^1 + 1}{n}) - c = f_i(1; \mathbf{x}_i^*)$$

if and only if (using (5)), $\frac{n^1}{n} \leq \tau$. So if $\mathcal{N}^1 \neq \emptyset$, $\mathbf{x}^*$ is a Nash equilibrium if and only if $\frac{n^1}{n} \leq \tau$. If $\mathcal{N}^1 = \emptyset$, so if $n^1 = 0$, $\mathbf{x}^*$ is always a Nash equilibrium (since $\tau > 0$).

Combining these two results, it follows that since there are only symmetric equilibria if $\frac{n_1}{n} \neq \tau$, the first Nash equilibrium exists and is unique if and only if $\frac{n^1}{n} > \tau$ (if $\mathcal{N}^0 \neq \emptyset$) and the second Nash equilibrium exists and is unique if and only if $\frac{n^1}{n} < \tau$.

If $\frac{n^1}{n} = \tau$, clearly both types of equilibria exist, but there are also other Nash equilibria. For suppose a multi-action $\mathbf{x}^*$ with $x_i^* = 0$ and $x_j^* = 1$ for $i, j \in \mathcal{N}^0$. Let $z := \sum_{l \in \mathcal{N}} x_l^*$ and note that $0 \leq n^1 \leq z - 1 < z \leq n - 1$. Then for $i \in \mathcal{N}^0$ and $j \in \mathcal{N}^0$ it is required, respectively,

$$f_i(0; \mathbf{x}_i^*) = b(k + \frac{z}{n}) - s\frac{n^1}{n} \geq b(k + \frac{z+1}{n}) - c = f_i(1; \mathbf{x}_i^*)$$

$$f_i(1; \mathbf{x}_i^*) = b(k + \frac{z}{n}) - c \geq b(k + \frac{z-1}{n}) - s\frac{n^1}{n} = f_i(0; \mathbf{x}_i^*).$$

Both inequalities hold if and only if $c - \frac{b}{n} = s\frac{n^1}{n}$, or $\frac{n^1}{n} = \tau$. $\blacksquare$

Lemma 7 *Suppose*

$$v^1(N_R, 0) < \tilde{w} + \Delta < v^1(L_A^- + \epsilon, 0), \tag{A.1}$$

with $\epsilon > 0$ infinitely small (see (22)). Then there exists $L_A = \tilde{L}$ that solves $v^1(L_A, 0) = \tilde{w} + \Delta$. Moreover, $\tilde{L}$ is unique and such that $L_A^- < \tilde{L} < L_A^a$.

Proof. Straightforward. ∎

Lemma 8 *Consider the pair of equations:*

$$\begin{cases} b(L_A)(k + \bar{n}^1) - c = \tilde{w} + \Delta \\ (1 - \bar{n}^1)L_A = (1 - \theta_R)N_R. \end{cases} \quad (A.2)$$

Suppose (A.1) and $(1 - \alpha)k > 1$ *(see (6)).[25] Then a solution pair* $(L_A, \bar{n}^1)$ *with* $\bar{n}^1 \geq 0$ *exists if and only if* $\theta_R \geq 1 - N_R/\tilde{L}$. *Denoting it by* $(L_A^c, \bar{n}_c^1)$, *the solution is also unique and such that* $\tilde{L} \leq L_A^c < L_A^b$. *Moreover, both* L_A^c *and* $\bar{n}_c^1$ *are strictly increasing in* θ_R.

Proof. Let $\bar{n}^1 = f_1(L_A)$ be defined bij the first equation of (A.2) with $b(L_A) := \pi L_A^{\alpha-1}$, and $\bar{n}^1 = f_2(L_A; \theta_R)$ by the second equation. Then f_1 describes a continuous, differentiable, strictly increasing, and strictly concave curve through the points $(\tilde{L}, 0)$ and $(L_A^b, 1)$. Similarly, for given θ_R, f_2 indicates a continuous, differentiable, strictly increasing, and strictly concave curve through the points $((1 - \theta_R)N_R, 0)$ and (N_R, θ_R); and as θ_R rises, f_2 shifts upwards. For a unique solution of $f_1(L_A) = f_2(L_A; \theta_R)$ for given θ_R, the latter must be such that also $\partial f_1/\partial L_A = \partial f_2/\partial L_A$. Solving these two equations for L_A and θ_R implies $\bar{n}^1 = (1 - k(1-\alpha))/(2 - \alpha) =: \bar{n}_0^1$. Now, since $(1 - \alpha)k > 1$, we have $\bar{n}_0^1 < 0$. Higher values of θ_R yield two solutions of $f_1(L_A) = f_2(L_A; \theta_R)$ for L_A, but only one of them implies $\bar{n}^1 > \bar{n}_0^1$. If θ_R rises to $1 - N_R/\tilde{L}$, the relevant solution for L_A implies $\bar{n}^1 = 0$, and the two points $(\tilde{L}, 0)$ and $((1 - \theta_R)N_R, 0)$ coincide. Clearly, if θ_R rises further beyond $1 - N_R/\tilde{L}$, the solution pair $(L_A^c, \bar{n}_c^1)$ is strictly increasing in both elements and such that $\tilde{L} < L_A^c < L_A^b$ and $0 < \bar{n}_c^1 < \theta_R$. ∎

Lemma 9 *Suppose (A.1). There exists* $L_A = \check{L}$ *that solves* $v^1(L_A, \tau(L_A)) = \tilde{w} + \Delta$. *Moreover,* $\check{L}$ *is unique and such that* $L_A^- < \check{L} < L_A^b$.

Proof. Note first that $v^1(L_A, \bar{n}^1) = \tilde{w} + \Delta$ with $0 \leq \bar{n}^1 \leq \tau(L_A)$ can be rewritten as $\bar{n}^1 = (\tilde{w} + \Delta + c)/b(L_A) - k$. The latter describes a continuous and strictly increasing curve through the points $(\tilde{L}, 0)$ and $(L_A^b, 1)$. Also τ is continuous and strictly increasing on $(L_A^-, N_R]$ with $\tau(L_A^- + \epsilon)$ approaching 0 as ϵ (> 0) falls and $\tau(N_R) < 1$. The result follows by noting that $L_A^- < \tilde{L} < L_A^b < N_R$. ∎

Proposition 10 *Consider the pair of differential equations (21) (see note 14). Suppose (A.1) and* $(1 - \alpha)k > 1$. *Define two parameters:*

$$\phi_1 := 1 - N_R/\tilde{L} \text{ and } \phi_2 := 1 - (1 - \tau(\check{L}))\check{L}/N_R,$$

and two sets:

$$S^c := \{(0, N_R - L_A^c)\} \text{ and } S^d := \{(0, N_R^1)\}.$$

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[25] The latter assumption is for convenience and eliminates the possibility of two solution pairs with $\bar{n}^1 \geq 0$.

Denote the set of stationary solutions by $\hat{S}(\theta_R)$. Then

$$\hat{S}(\theta_R) = \begin{cases} S^a & \text{if} \quad 0 \le \theta_R \le \theta_R^- \\ S^a \cup S^b & \text{if} \quad \theta_R^- < \theta_R \le \theta_R^+ \\ S^b \cup S^d & \text{if} \quad \theta_R^+ < \theta_R < \phi_1 \\ S^b \cup S^c & \text{if} \quad \phi_1 \le \theta_R \le \phi_2 \\ S^b & \text{if} \quad \phi_2 < \theta_R \le 1. \end{cases}$$

Proof. Let a stationary solution be denoted by (M_*^0, M_*^1) or $(L_{A*}, \bar{n}_*^1)$. Using (11), (18), and note 14, it holds for each j

$$\begin{aligned} v^j(L_{A*}, \bar{n}_*^1) &\le \tilde{w} + \Delta && \text{if} \quad M_*^j = N_R^j \\ v^j(L_{A*}, \bar{n}_*^1) &= \tilde{w} + \Delta && \text{if} \quad 0 \le M_*^j \le N_R^j \\ v^j(L_{A*}, \bar{n}_*^1) &\ge \tilde{w} + \Delta && \text{if} \quad M_*^j = 0. \end{aligned} \qquad (A.3)$$

Recall that, by (22), $0 < M_*^0 + M_*^1 < N_R - (L_A^- + \epsilon)$.

Case I: $0 < \theta_R < 1$. Note first that if $0 \le \bar{n}_*^1 \le \tau(L_{A*})$, then $v^0(L_{A*}, \bar{n}_*^1) > v^1(L_{A*}, \bar{n}_*^1)$; and if $\tau(L_{A*}) < \bar{n}_*^1 \le 1$, then $v^0(L_{A*}, \bar{n}_*^1) = v^1(L_{A*}, \bar{n}_*^1)$. In the former, (A.3) and (22) allow for three possibilities:

- $v^0(L_{A*}, \bar{n}_*^1) > v^1(L_{A*}, \bar{n}_*^1) = \tilde{w} + \Delta$. So $M_*^0 = 0$ and $0 < M_*^1 \le N_R^1$. To determine M_*^1, note that the two equations: $v^1(L_{A*}, \bar{n}_*^1) = \tilde{w} + \Delta$ and $M_*^0 = 0$, are represented by (A.2) in Lemma 8. Hence, $M_*^1 = N_R - L_A^c$ provided that $\theta_R \ge 1 - N_R/\check{L} =: \phi_1$ (granting $(1-\alpha)k > 1$) and $\bar{n}_*^1 = \bar{n}_c^1 \le \tau(L_A^c)$. Now consider the latter requirement. If $\theta_R = 1 - N_R/\check{L}$, we have $(L_A^c, \bar{n}_c^1) = (\check{L}, 0)$. Here $\check{L} < \breve{L}$ (see Lemma 9), because $\tau(\breve{L}) > 0$. Since both L_A^c and $\bar{n}_c^1$ are strictly increasing in θ_R by Lemma 8, it implies that as θ_R rises from $1 - N_R/\check{L}$, then $L_A^c = \breve{L}$ and $\bar{n}_c^1 = \tau(\breve{L})$ will occur when $\theta_R = 1 - (1 - \tau(\breve{L}))\breve{L}/N_R =: \phi_2$. In sum, $M_*^0 = 0$ and $M_*^1 = N_R - L_A^c$ if $\phi_1 \le \theta_R \le \phi_2$.

- $v^0(L_{A*}, \bar{n}_*^1) > \tilde{w} + \Delta > v^1(L_{A*}, \bar{n}_*^1)$. So $M_*^0 = 0$ and $M_*^1 = N_R^1$. It implies $L_{A*} = N_R^0$ and $\bar{n}_*^1 = 0 \le \tau(N_R^0)$. Now recall the definitions of $\check{L}$ and L_A^a and note that $v^j(\cdot, 0)$ is continuous and strictly decreasing on $[\check{L}, L_A^a]$. Then it is required that $\check{L} < N_R^0 < L_A^a$, or $1 - L_A^a/N_R < \theta_R < 1 - \check{L}/N_R$. Hence, $M_*^0 = 0$ and $M_*^1 = N_R^1$ if $\theta_R^+ < \theta_R < \phi_1$.

- $v^0(L_{A*}, \bar{n}_*^1) = \tilde{w} + \Delta > v^1(L_{A*}, \bar{n}_*^1)$. So $0 \le M_*^0 < N_R^0$ and $M_*^1 = N_R^1$. It implies $\bar{n}_*^1 = 0$ and, solving $v^0(L_A, 0) = \tilde{w} + \Delta$ for L_A, $L_{A*} = L_A^a$. (Note that $\bar{n}_*^1 = 0 \le \tau(L_A^a)$.) So $M_*^0 = N_R^0 - L_A^a$. To ensure that $M_*^0 \ge 0$, we require $\theta_R \le 1 - L_A^a/N_R$. Hence, $M_*^0 = N_R^0 - L_A^a$ and $M_*^1 = N_R^1$ if $0 < \theta_R \le \theta_R^+$.

If $\tau(L_{A*}) < \bar{n}_*^1 \le 1$, then $v^0(L_{A*}, \bar{n}_*^1) = v^1(L_{A*}, \bar{n}_*^1)$. Given assumption (22), only one possibility remains:

- $v^0(L_{A*}, \bar{n}^1_*) = v^1(L_{A*}, \bar{n}^1_*) = \tilde{w} + \Delta$. So $0 \le M^j_* \le N^j_R$ $(j = 0, 1)$. Now, recalling the definition of L^b_A, we find $L_{A*} = L^b_A$ and $\tau(L^b_A) < \bar{n}^1_* \le 1$. So $M^0_* = N^0_R - (1 - \bar{n}^1_*)L^b_A$ and $M^1_* = N^1_R - \bar{n}^1_* L^b_A$. Noting that $M^0_* \le N^0_R$ and $M^1_* < N^1_R$, we require $M^j_* \ge 0$ $(j = 0, 1)$. This gives $1 - N^0_R/L^b_A \le \bar{n}^1_* \le N^1_R/L^b_A$. Hence, $M^0_* = N^0_R - (1 - \bar{n}^1_*)L^b_A$ and $M^1_* = N^1_R - \bar{n}^1_* L^b_A$ with $\bar{n}^1_* \in (\tau(L^b_A), 1] \cap [1 - N^0_R/L^b_A, N^1_R/L^b_A]$. The intersection is non-empty if and only if θ_R is such that $N^1_R/L^b_A > \tau(L^b_A)$, or $\theta_R > \theta^-_R$.

Case II: $\theta_R = 0$. By (22), $0 < M^0_* < N_R - (L^-_A + \epsilon)$. So, by (A.3) and noting that $\bar{n}^1_* = 0$, L_{A*} follows from $v^0(L_{A*}, 0) = \tilde{w} + \Delta$. So $L_{A*} = L^a_A$. Hence, $M^0_* = N_R - L^a_A$.

Case III: $\theta_R = 1$. By (22), $0 < M^1_* < N_R - (L^-_A + \epsilon)$. So, by (A.3) and noting that $\bar{n}^1_* = 1$, L_{A*} follows from $v^1(L_{A*}, 1) = \tilde{w} + \Delta$. So $L_{A*} = L^b_A$. Hence, $M^1_* = N_R - L^b_A$. ■

Proposition 11 *The stationary solutions $(0, N_R - L^c_A)$ and $(0, N^1_R)$ do not represent underemployment equilibria (see Proposition 10).*

Proof. Using (20), the lock-in condition (19) can be rewritten as $M^1_* \le ((\hat{u} - \theta_U)N_U + \hat{u}M^0_*)/(1 - \hat{u})$. Substituting $(M^0_*, M^1_*) = (0, N_R - L^c_A)$, it requires $N_R - L^c_A \le (\hat{u} - \theta_U)N_U/(1 - \hat{u})$. However, noting that $L^c_A < L^b_A$ by Lemma 8, assumption (26) implies $(\hat{u} - \theta_U)N_U/(1 - \hat{u}) < N_R - L^b_A < N_R - L^c_A$, which gives a contradiction.

Similarly, substituting $(M^0_*, M^1_*) = (0, N^1_R)$, the lock-in condition requires $N^1_R \le (\hat{u} - \theta_U)N_U/(1 - \hat{u})$. Because $N^1_R = \theta_R N_R > \theta^+_R N_R = (1 - L^a_A/N_R)N_R = N_R - L^a_A$ and $L^a_A < L^b_A$, (26) implies $(\hat{u} - \theta_U)N_U/(1 - \hat{u}) < N_R - L^b_A < N_R - L^a_A < N^1_R$ – a contradiction. ■

Proof of Proposition 2. *Existence.* Follows from the proof of Proposition 10.

Stability. See working paper/website of this journal. ■

Comment on note 12

Following Strand (1987), we determine $\bar{h}^1$ and show that $\bar{h}^1$ depends positively on $\bar{u}^1$ and $\bar{h}^1 = 1$ if $\bar{u}^1 = 1$. Now, in a steady state with the low no-shirking wage, the number of workers hired by firms per unit time must be equal to the number of workers who are fired or who retire per unit time, so the rate of hiring is $(\delta + q)L^0_F + \delta L^1_F$. The expected output of a randomly hired worker simply equals the fraction of citizens among those hired $(\bar{h}^1)$, so

$$\bar{h}^1 = \frac{\delta L^1_F}{(\delta + q)L^0_F + \delta L^1_F}. \tag{A.4}$$

For each type of worker, the inflow into the informal sector is the same as the outflow. For familists, the inflow consists of δM^0 rural migrants, δN^0_F urban-born entrants, and qL^0_F laid-off workers; the outflow equals aL^0_I job finders and δL^0_I exits. Hence, $\delta M^0 + \delta N^0_F + qL^0_F = aL^0_I + \delta L^0_I$, or (using $L^j_A + L^j_I + L^j_F = N^j$ and $M^j = N^j_A - L^j_A$)

$$L^0_F = \frac{a}{q + \delta + a}(N^0 - L^0_A) = \frac{a(1 - \bar{u}^1)}{q + \delta + a}(N - L_A),$$

where $\bar{u}^1 := (N^1 - L_A^1)/(N - L_A)$. Similarly, the inflow of citizens into the informal sector consists of δM^1 rural migrants and δN_F^1 urban-born entrants; the outflow equals aL_I^1 job finders and δL_I^1 exits. Hence, $\delta M^1 + \delta N_F^1 = aL_I^1 + \delta L_I^1$, or

$$L_F^1 = \frac{a}{\delta + a}(N^1 - L_A^1) = \frac{a\bar{u}^1}{\delta + a}(N - L_A).$$

With these results for L_F^0 and L_F^1 and (A.4), we arrive at

$$\bar{h}^1 = \frac{\delta(\delta + a + q)\bar{u}^1}{(\delta + q)(\delta + a)(1 - \bar{u}^1) + \delta(\delta + a + q)\bar{u}^1}.$$

The right-hand side indeed depends positively on $\bar{u}^1$ and equals 1 if $\bar{u}^1 = 1$.

Proposition 12 *Suppose a high-employment equilibrium in the absence of familist workers (so in case $N^0 = 0$). Total welfare in this equilibrium is higher than in any underemployment equilibrium if*

$$\frac{\tilde{d}}{q} \geq \frac{b(L_A^a) - c}{r + \delta}.$$

Proof. Figure 1 indicates the optimal level of formal-sector employment L_F^{**} in case of the aggregate NSC of civic workers. Defining $\tilde{\Delta} := \Delta + (r + \delta)\tilde{d}/q$, we find for given urban labour supply:

$$L_F^{**} = \left(\frac{\tilde{\Delta}}{\tilde{\Delta} + (e - \tilde{d})\delta/q}\right) \cdot (N - L_A).$$

As in the text, this result can be used to find the equilibrium job-finding rate: $a^{**} := \tilde{\Delta}q/(e - \tilde{d})$, and so lifetime utility in the informal sector: $V_I^1 = (\tilde{w} + \tilde{\Delta})/(r + \delta)$. Now, proceeding as in note 21, total welfare in a high-employment equilibrium without familists is

$$\frac{(\tilde{w} + \tilde{\Delta})(N - L_F^{**}) + (1 - e)L_F^{**}}{r + \delta}$$

and total welfare in an underemployment equilibrium is

$$\frac{(\tilde{w} + \Delta)(N - L_F^*) + (1 - e)L_F^*}{r + \delta}.$$

Because $\tilde{w} + \tilde{\Delta} < 1 - e$ by assumption (12) and $\tilde{\Delta} > \Delta$, the former is higher if $L_F^{**} \geq L_F^*$. Noting (17), this holds for given L_A (see Figure 1). Hence, it is sufficient to require that $L_A^{**} \leq L_A^*$, where L_A^{**} is implicitly defined by $v^1(L_A^{**}, 1) = \tilde{w} + \tilde{\Delta}$ (note that L_A^{**} approaches L_A^b from below as $\tilde{d}$ falls to zero). The underemployment equilibrium with the highest welfare has $L_A^* = L_A^a$ (see Section 3), which is implictly defined by $v^0(L_A^a, 0) = \tilde{w} + \Delta$. Now, using (7), $v^1(L_A, 1) = \tilde{w} + \tilde{\Delta}$ is equivalent to

$$v^0(L_A, 0) + b(L_A) - c - (r + \delta)\frac{\tilde{d}}{q} = \tilde{w} + \Delta.$$

29

Note that the left-hand side is strictly decreasing in L_A. Then because $v^0(L_A^a, 0) + b(L_A^a) - c - (r+\delta)\tilde{d}/q \leq \tilde{w} + \Delta$, we have $L_A^{**} \leq L_A^a$. ∎

Derivation of (13) and (18)

Granting that utility is additive in wages, effort, and disutilities, we find similarly as before

$$V_F^j(\text{N}) = \frac{w - e}{r + \delta} \text{ and } V_F^j(\text{S}) = \frac{w - j\tilde{d} + qV_I^j}{r + \delta + q}.$$

So $V_F^j(\text{N}) \geq V_F^j(\text{S})$ leads to $w \geq (r+\delta)V_I^j + e + (r+\delta)(e - j\tilde{d})/q$. This inequality can be simplified by determining V_I^j. Since an underemployment equilibrium has no shirking, V_I^j depends on $V_F^j(\text{N})$. It implies

$$V_I^j = \frac{\tilde{w} + aV_F^j(\text{N})}{r + \delta + a} = \frac{\tilde{w}}{(r+\delta)} + \frac{(w - e - \tilde{w})a}{(a + r + \delta)(r + \delta)}.$$

Substituting this outcome into the above inequality gives (13). This outcome with $w = 1$ and $a = \Delta q/e$ gives (18). It is now easy to verify that $V_I^j < V_F^j(\text{N})$.

Proof of Theorem 4. Here is a sketch of a proof. An underemployment equilibrium with minimum social capital has $\lambda_* = 0 = \bar{n}_*^1$. So (30) implies

$$\dot{\theta}_R = \begin{cases} -\theta_R & \text{if} \quad 0 \leq \theta_R \leq \min(-\hat{\Phi}(-1), \theta_R^a) \\ \hat{\Phi}(-1) & \text{if} \quad \min(-\hat{\Phi}(-1), \theta_R^a) < \theta_R \leq \theta_R^a. \end{cases}$$

Because $\dot{\theta}_R < 0$ on $(0, \theta_R^a]$, θ_R will fall over time and a stable long-run equilibrium will be attained at $\theta_R = 0$.

An underemployment equilibrium with maximum social capital has $\lambda_* = 1$ and $\bar{n}_*^1 \leq 1$. If $\bar{n}_*^1 < 1$, it implies

$$\dot{\theta}_R = \begin{cases} \hat{\Phi}(1 - \bar{n}_*^1) & \text{if} \quad \theta_R^- < \theta_R \leq \min(1 - \hat{\Phi}(1 - \bar{n}_*^1), \theta_R^b) \\ 1 - \theta_R & \text{if} \quad \max(\theta_R^-, 1 - \hat{\Phi}(1 - \bar{n}_*^1)) < \theta_R \leq \theta_R^b. \end{cases}$$

Because $\dot{\theta}_R > 0$ on $(\theta_R^-, \theta_R^b]$, θ_R will rise and cause a disintegration of the underemployment equilibrium as θ_R tends to surpass θ_R^b. If $\bar{n}_*^1 = 1$, $\dot{\theta}_R = \hat{\Phi}(1)$ if $\theta_R^- < \theta_R \leq \min(1 - \hat{\Phi}(1), \theta_R^b)$ and $\dot{\theta}_R = 1 - \theta_R$ if $\max(\theta_R^-, (1 - \hat{\Phi}(1))) < \theta_R \leq \theta_R^b$, which yields a similar result. ∎

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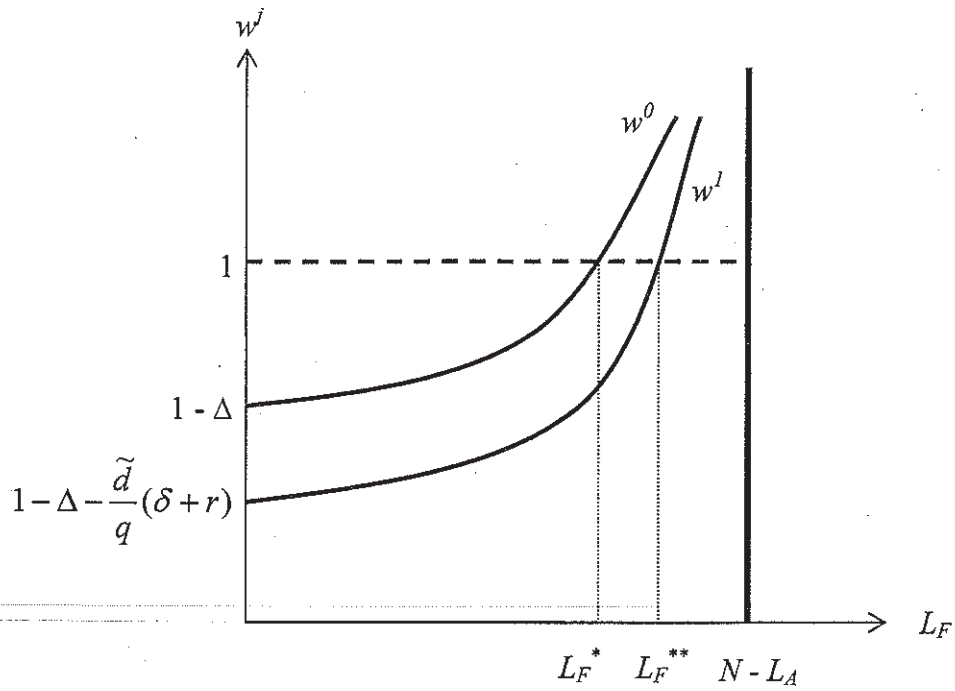
Figure 1 Determination of formal urban employment and the size of the informal sector. Here $w^j = \tilde{w} + e + \dfrac{e - j\tilde{d}}{q}\left(\dfrac{\delta(N - L_A)}{N - L_A - L_F} + r \right)$ $(j = 0,1)$.
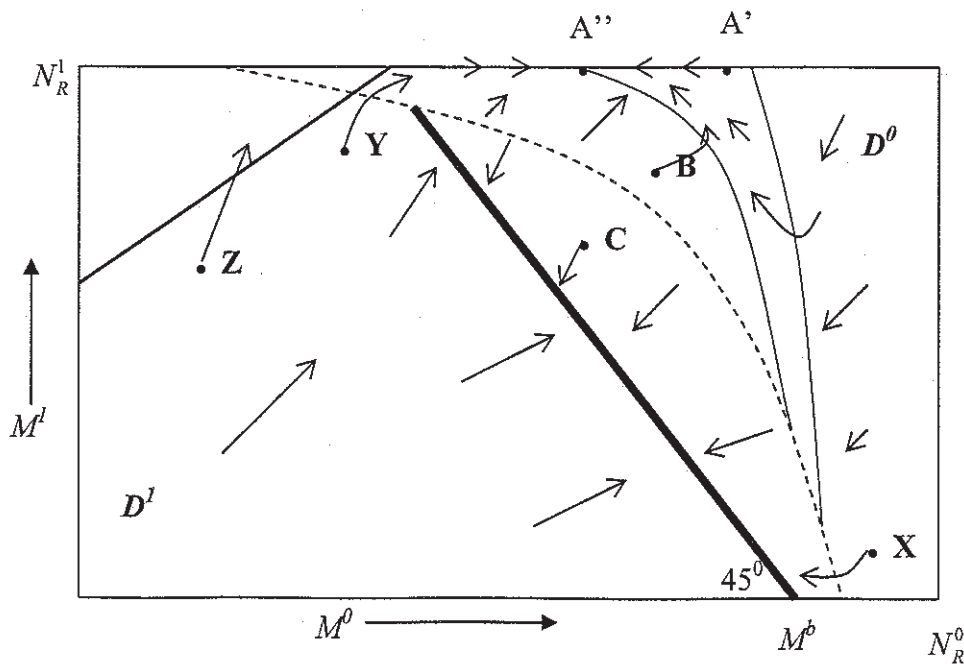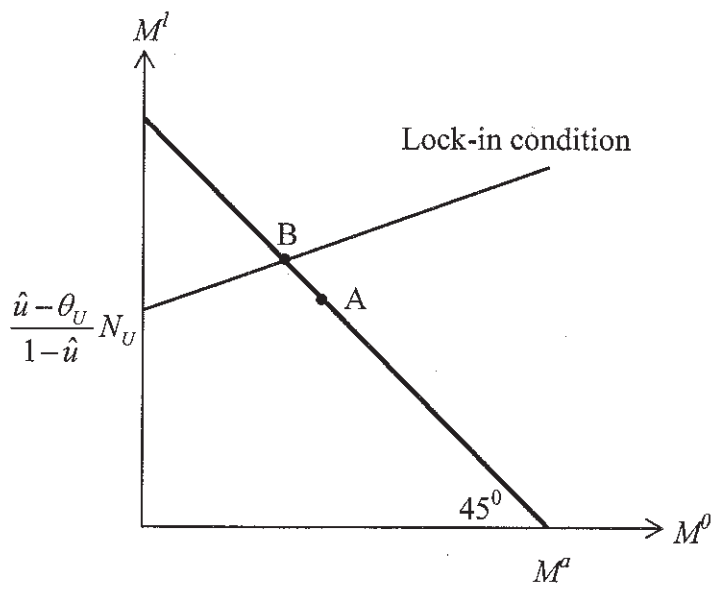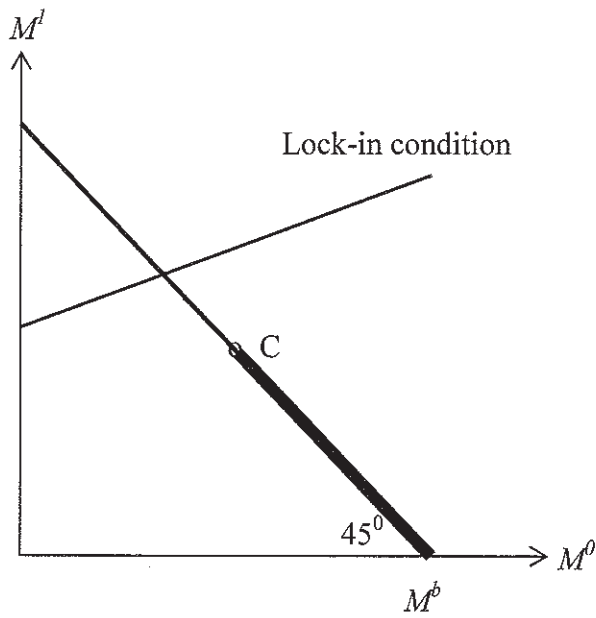

Figure 3 Dynamics of migration

M^I

Lock-in condition

B

A

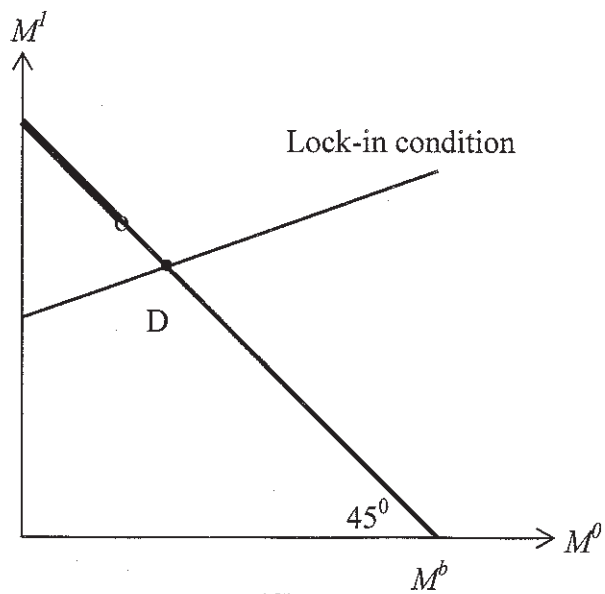$\dfrac{\hat{u} - \theta_U}{1 - \hat{u}} N_U$

45^0

M^0

M^a

(A)

Figure 2 Underemployment equilibria with minimum and maximum social capital

M^I

Lock-in condition

C

45^0

M^0

M^b

(B)

M^I

Lock-in condition

C

D

45^0

M^0

M^b

(C)